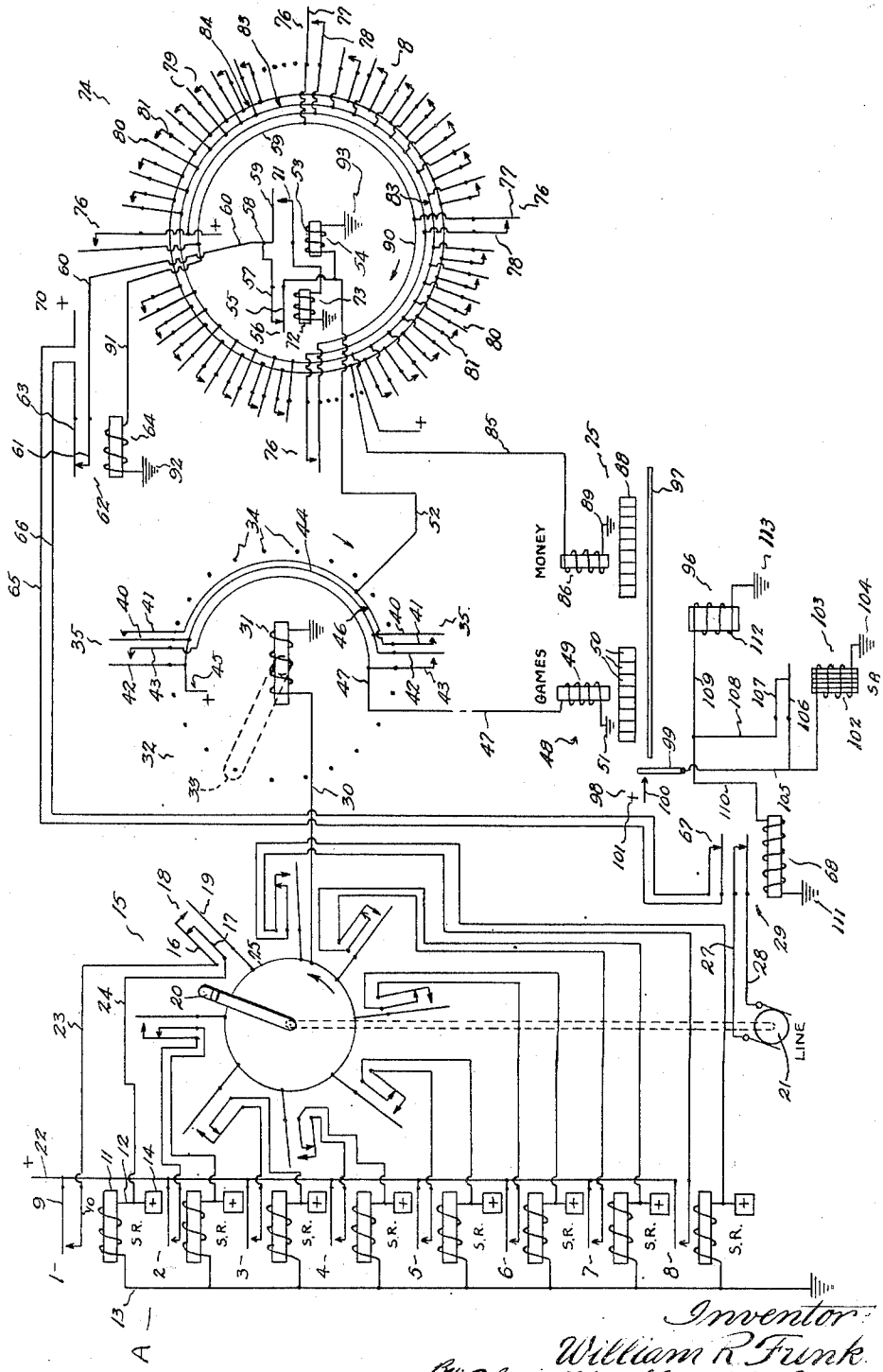
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TOTALIZING SYSTEM FOR PLURAL TOLL STATIONS

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TOTALIZING SYSTEM FOR PLURAL TOLL STATIONS

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This invention relates to a new and novel structure for recording the number of frames played in the game of bowling and to compute and record the rental due for the use of the equipment.

The structure disclosed herein is new and novel and although it has particular application to bowling alleys and especially those bowling alleys employing automatic pin setting devices, it is to be understood that the novel features are not to be limited to this use solely.

One of the features of the invention is the provision of means for producing an impulse at the end of each game frame and for collecting such impulses as rapidly as produced and for thereafter transmitting such impulses to a receiving means adapted to energize a circuit to effect the recording of a predetermined number of said game frames and simultaneously to energize a series of circuits adapted to operate in accordance with a predetermined setting to compute the charge to be made for the use of the equipment.

Another feature of the invention is the provision of means which may momentarily cut out the collector, impulse receiving and game recording mechanism and the computing apparatus at the time of providing for a transfer impression upon a card from the game and cost recorders whereby to prevent interference with and improper transmission of impulses imposed upon the system in the rapid and successive use of the bowling alleys.

In the game of bowling, there are usually a number of alleys grouped together and most, if not all, of them will be simultaneously used during certain periods. A complete game may consist of ten frames, or twelve frames if the player strikes out in the tenth frame. It will be apparent that the very nature of the game and the fact that many alleys are used at the same time presents a real problem to the question of recording games and computing a reasonable charge if a single mechanism is to be employed for all alleys. With the use of eight alleys as an example, frames are being completed at a rapid rate and the mechanism provided must be able to pick up the frames completed on each alley together with the completed frames on all of the other alleys without regard necessarily for the completion of a game on any one alley. Likewise, the game is played in a way making it impossible to determine through the mere use of the alley itself whether any frame that is played

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is the finishing frame of a game or the beginning of the next game.

The invention disclosed is directed primarily to apparatus capable of solving the above problems and of accomplishing the desired results without employing mechanism of a complicated character or mechanism requiring an initial investment of a substantial sum of money or frequent attention in order to keep the same in an operating condition.

The invention is also concerned with apparatus capable of positive operation. The structure disclosed makes certain that all frames, irrespective of the alley or alleys on which they are completed, will be recorded. The rate of operation is such that there will be no overlapping of frames in the recording of frames on any one alley and that the frames played on one alley will not interfere with the frames played on other alleys.

If the cost is also to be computed, although it is to be understood that this part of the disclosure can be omitted in so far as the novelty of the other features are concerned, the invention disclosed will also enable the attendant to know the amount in dollar value that is owed for the frames played. The invention is designed to prevent a locking out action of the alleys from the recording control so as to prevent use of the alleys without being shown by the recording control.

Other objects and advantages of the invention will be apparent from the following detail explanation when taken in connection with the accompanying drawing.

In the accompanying drawing, the figure illustrates a schematic diagram of one form of structure embodying the invention.

The bowling alleys have not been illustrated, but they are represented by switching mechanism designated broadly as A. Switching mechanism A comprises a plurality of normally open switches 1 to 8, inclusive, each having a relay 11 and a pair of contacts 9 and 10 suitably arranged for relative movement upon energization of relay 11. Each relay 11 may be of the slow release type and in a circuit including wires 12 and 13 receiving an impulse each time a frame is completed in the game of bowling. The mechanism of the structure causing current to flow through the circuit when a frame is finished is not a part of the invention disclosed, but is represented broadly at 14 for each bowling alley. It will be understood therefore that part 14 illustrated in the drawing is representative of a structure capa-

ble of indicating the completion of a frame and of transmitting an impulse through the circuit of relay 11 to cause contacts 9 and 10 to close. Switches 1 to 8 inclusive may vary in number according to the number of alleys connected in the control system herein disclosed. These switches may be individually constructed and mounted at each alley or they may be arranged in unitary relation in a single structure and be connected in circuit with the respective elements 14.

A collector 15 in the form of a rotary sweep switch is provided with a series of normally closed contacts 16 and 17 arranged in pairs to form individual switches designated 18, each being provided with a normally open contact 19. A sweep arm 20 rotated by motor 21 is arranged to close each of the normally open contacts 19 of switches 18 in a complete movement about its axis or about its path of travel. Assume that the bowling alley represented for example by switch 1 has had a frame completed by the players on this alley and device 14 has been operated to energize instantly relay 11 so as to cause the contacts 9 and 10 to close. With contact 9 connected in, say the positive side of a circuit represented by a wire 22, current will immediately flow from wire 22 through contacts 9 and 10 through wire 23 to contact 16 of switch 18, then through contact 17, a wire 24, wire 12 and through the coil of relay 11 to the return side of the circuit represented by wire 13. Relay 11 will then remain energized and contacts 9 and 10 will be held closed. Thus relay 11 will be immediately energized and current caused to flow through the contacts 16 and 17 of switch 18, as the result of contacts 9 and 10 being held closed, until the circuit is broken at switch 18 by the normally open contact 19. Sweep arm 20 will effect such opening of contacts 16 and 17 when it travels through its path of movement and comes into engagement with contact arm 19. It will be observed that contacts 16, 17 and 19 are preferably arranged to be of the type known as the "make before break" so that a circuit 25 common to the contacts 19 of all the switches 18 will be momentarily pulsed. If contact 19 of any of the switches 18 engages contact 16, the current is caused to flow through common circuit 25, then continued movement of contact 19 will break the engagement of contact 16 with contact 17, thus de-energizing the circuit containing contacts 9 and 10 and relay 11.

Motor 21 is in a separate circuit comprising wires 27 and 28 and a switch 29, the purpose of which will be later explained. It will be noted that each of the switches 1 to 8, inclusive, is shown with a separate switch 18 in the rotary switching mechanism 15. The circuits of switches 1 to 8, inclusive, including the switches 18 will be energized and de-energized as rapidly as the players on the alleys can complete their game frames. The players are not required to coordinate their playing with the players on other alleys. For example, the players of alley No. 4 can complete as many game frames as they desire without regard to whether or not any players are on any of the other alleys. If the switch 18 connected in the circuit of switch 4 of alley No. 4 has current flowing through its contacts 16 and 17, the continued movement of sweep arm 20 will repeatedly engage the contact 19 of this particular switch 18 and cause it to engage contact 16 to energize the common circuit designated 25 and thereafter break the circuit of the switch 18 so that the relay 11 of alley switch 4 will be conditioned for re-energization upon completion of the next game frame, and so on, by the players on alley 4.

The common circuit designated 25 is connected by a wire 30 connected with the coil of a relay 31 of a second rotary sweep switch 32 which may be termed the game computer because it functions to advance a single step each time an impulse is imposed upon the common circuit 25 by the completion of a frame on any one of the alleys. This rotary switch 32 may be of any desirable construction having relay 31 operating a sweep arm illustrated in dotted lines at 33 by means of a suitable ratchet mechanism (not shown) capable of advancing sweep arm 33 a step each time relay 31 is energized.

This second rotary switch 32 is adapted to have a plurality of contacts 34 arranged in a manner that will depend upon the number of frames to be allocated to a game. Assuming for the purposes of this disclosure that 11 frames are to be considered a game, every eleventh contact 34 will become a station having a switch 35 arranged to be actuated by sweep arm 33 when every eleventh frame is completed, whether all on one alley or on a number of alleys. Rotary switch 32 is illustrated in the drawing with two switches 35, but it will be understood that any number of sets of eleven contacts 34 may be provided.

Each switch 35 comprises two sets of contacts 40 and 41 and 42 and 43. Contacts 40 and 42 of each switch 35 are connected to a wire 44 in a circuit receiving current at the point 45. Contacts 41 and 43 are in separate circuits. Contacts 41 are connected to a wire 46 while contacts 43 are connected to a wire 47 leading to a game counter represented broadly as 48, which may be power operated and adapted to be actuated each time the circuit wire 47 is pulsed. Game counter 48 may comprise the usual power electromagnet 49 and counter wheels 50 which will be rotated in proper succession each time the electromagnet 49 is actuated. This pulsing of circuit 47 will occur each time sweep arm 33 revolves and passes one of the stations represented by the eleventh contact 34 whereby contacts 42 will engage contacts 43 and cause the current to flow through wire 47 beginning at the point 45 and ending at the ground connection 51 of the counter electromagnet 49. It will thus be observed that game counter 48 will actuate to register a game each time a switch 35 is actuated, which will be after a predetermined number of frames have been completed on the alleys. The game registered by counter 48 is not necessarily a game played by the players on any one alley, but will be the completion of a number of frames on all of the alleys representative of a game and chosen at the outset as the value to be accepted for a game through the spacing of the switches along contacts 34.

When contacts 42 and 43 of switches 35 are closed by sweep arm 32, contacts 40 and 41 will also be closed. Closing contacts 40 and 41 energizes a circuit 52 furnishing current to the coil 53 of a relay 54 and to normally closed contact 55 of a switch 56. The other contact 57 of switch 56 is connected at 58 to a contact 59 of a second switch 59' and a wire 60 leading to contact 61 of a switch 62, also having a contact 63 adapted to move to closed position upon contact 61 when a relay 64 is energized. Switch 62 is in a circuit comprising wires 65 and 66 having a normally

closed switch 67 connected therein adjacent to control switch 29 of motor 21. Both switches 29 and 67 are controlled by a relay 68. With switches 62 and 67 normally closed, current will be supplied at 70 to wire 65 through switch 67, switch 62 and wire 60. It will flow through switch 56 and coil 53 of relay 54 to the ground or return side 93. However, current originally flows through coil 53 from circuit 52 when it is energized through the closing of contacts 40 and 41 of either of the switches 35. This will cause contact 59 to engage the other contact 71 of switch 59' and energize a coil 72 of a relay 73 to open switch 56.

Both relays 54 and 73 comprise the motor means for actuating a sweep arm (not shown) of a third rotary switching device 74 termed herein as a cost computer. Cost computer 74, together with a cost counter 75, registers the amount to be charged per game registered by the game counter 48.

Cost computer 74 is designed to have a plurality of master switches 76, each of which includes a movable contact 77 and a stationary contact 78. Master switches 76 are normally open and are spaced from each other a predetermined number of stations. Between master switches 76 there is disposed a number of auxiliary switches 79, each comprising a movable contact 80 and a stationary contact 81, but the number of the latter will vary according to the charge to be made for each game. Each station may comprise a set of terminals of a number greater in terms of cents than is charged for a game. Each pair of terminals receives one of the auxiliary switches 79. Movable contacts 80 of all auxiliary switches 79 are connected in circuit by a wire 83, while the fixed contacts 81 are connected in circuit by a wire 84, which also is connected to a wire 85 connected to the electromagnet 86 of cost counter 75 having a series of driven numeral wheels 88. The end of the winding of electromagnet 86 may be grounded at 89 in order to complete the circuit when current flows through wire 85 and the winding of electromagnet 86. It will be observed that this circuit 85 of cost computer 74 will be energized each time one of the auxiliary switches 79 is closed in order to actuate cost counter 75 and advance the numeral wheels one step. Each master switch 76 of cost computer 74 comprises, as stated, the movable contact 77 and the stationary contact 78. The cost computer is provided with a sweep arm (not shown) of the same character as sweep arm 33 of game computer 32, but it will be understood that any type of sweep arm may be used on any type of actuator that is commonly employed in a rotary switching mechanism. Movable contact 77 of each master switch 76 is connected in circuit by a wire 90, the latter being connected by a wire 91 to the coil of relay 64 which is grounded at the opposite end at 92.

In the operation of the system disclosed, registering a game by the game computer 32 will energize circuit 52, which in turn sends current through coil 53 of relay 54 which is grounded at 93. This causes contacts 59 and 71 of switch 59' to close and actuate the ratchet mechanism (not shown) or other mechanism provided that functions to operate the sweep arm of the cost computer 74. When contacts 59 and 71 are closed, current will immediately flow from the point 70 through the circuits 65—66, contacts 61 and 63 of switch 62 and through wire 60. The current will then flow through contact arm 59, contact arm 71 and through the coil 72 of relay 73 to

ground. When relay 73 is actuated, the ratchet mechanism is again advanced so that a double action creates a positive stroke for the ratchet mechanism that operates this sweep arm of cost computer 74. One of the relays may effect the outward stroke of the pawl of the ratchet mechanism and the other relay may effect the return movement of the pawl. In any event, a complete stroke will cause a sweep arm to close the contacts 80 and 81 of one of the auxiliary switches 79 and this will continue across one set of these auxiliary switches until a master switch 76 is reached, whereupon the sweep arm will close the contacts of this master switch 76 and energize the circuit 85 leading to the cost counter 75. When a master switch 76 is energized, the circuit 91 of relay 64 is energized to cause relay 64 to open contact 61 and 63 so as to momentarily break the current flow leading to the relays 54 and 73. Operation of relays 54 and 73 is initiated when circuit 52 is momentarily energized by the closing of contacts 40 and 41 of one of the switches 35 of game counter 32. Momentary energization of circuit 52 sets relay 54 into action so as to cause its switch 59' to be closed. This will in turn energize the coil circuit of relay 73 so as to cause its switch 56 to be opened. Inasmuch as the impulses through circuit 52 are of short duration, relay 54 will be de-energized to open its switch 59'. This terminates the current flow through coil 72 of relay 73 to cause contacts 55 and 57 to close, which occurs of course when this relay 73 is de-energized. Current then flows through switch 56 again from source 70 through the circuit represented by wires 65 and 66 and wire 60. Coil 53 of relay 54 is again energized to close its switch 59' to cause flow of current through it and the energization of relay 73 to open switch 56 and again de-energize relay 54, etc. Alternate energization of relays 54 and 73 continue until the sweep arm closes one of the master switches 76. Before this occurs, however, the number of auxiliary switches 79 in front of the master switch 76 will be closed so as to pulse or energize circuit 85 each time to actuate the cost counter 75 and advance it one digit each time. Operation of a master switch 76 stops the alternate operation of relays 54 and 73 until circuit 52 is again energized by the contacts 40 and 41 of any one of the switches 35 of the game computer 32 being closed.

As previously stated, the closing of each auxiliary switch 79 advances the counter wheels of cost counter 87 one digit. If a 7 cent charge is to be made for a game, it will be apparent that the money counter 75 will be advanced seven digits if seven auxiliary switches 79 are provided. The arrangement disclosed is exceptionally flexible in obtaining any desirable charge for a game. Game charges may not necessarily be computed upon whole sums, but fractional charges may also be used. For example, every second group of auxiliary switches 79 may carry an additional auxiliary switch so that a game charge of 7½ cents will be made for each game when the cost of two games is registered at money counter 75. Each cost computer 74 may be divided into four sections as illustrated in the drawing, or any other number of sections. Only one of the four sections need carry an additional auxiliary switch 79 in order to provide an additional fractional charge of ¼ cent per game when the full cost of four games has been registered by money counter 75. As stated, money counter 75 is arranged to register each closing operation of an

auxiliary switch 79. Hence, any additional auxiliary switches 79 will add to the cost of the games played in accordance with the number added for the number of sections into which the cost computer 74 is divided.

Suitable printing means 96 may be furnished to print the indications of counter wheels 50 of the game counter 48 and counter wheels 88 of the money counter 75 upon a card 97 that may be suitably inserted into a slot of the housing accommodating the structure herein disclosed. Printing mechanism 96 may be actuated either to bring counter wheels 50 and 88 against the inserted card 97 or to raise a platform on which card 97 is resting in order to make the printed impression.

Printing mechanism 96 may be actuated by any suitable mechanism, there being shown a switch 98 having a contact 99 adapted to be engaged and pushed against a contact 100 to close the circuit. Contact 100 may connect at 101 to a source of current supply or one side of the circuit. Current will then flow through contact 100, contact 99 and wire 105 in circuit with the winding 102 of a slow acting relay 103. Winding 102 may connect to the opposite side of the circuit at 104. Closing switch 98 by the insertion of card 97 causes current to flow from source 101, through contacts 100 and 99, wire 105 through contacts 106 and 107 to a wire 108 in circuit with wires 109 and 110. Wire 110 is in circuit with the winding of relay 68 grounded at 111. Energizing relay 68 momentarily opens switches 29 and 67 so that the motor 21 is momentarily stopped to prevent movement of its sweep arm 20 from opening any of the switches 18 of the collector 15 during a printing operation. Likewise, opening the normally closed switch 67 will momentarily prevent operation of the relays 54 and 73 that actuate the money computer 74 during the printing operation. It will, therefore, be impossible for either the collector 15 or the money computer 74 to operate and thus interfere with the printing operation while it is taking place, or, vice versa, to allow the printing operation to interfere with the operation of collector 15 and the cost computer 74.

Returning to circuit 109, current will also flow through winding 112 of relay 96 actuating the printing mechanism. Winding 112 is grounded at 113 to complete the circuit. When printing switch 98 is closed, current will also flow to slow acting relay 103. Being a slow acting relay, it will permit current to flow through contacts 106 and 107 to energize and actuate relays 68 and 96 before it will operate to open contacts 106 and 107. Hence, it will be apparent that continued flow of current through circuit 105 by any improper act of holding card 97 against contact 99 to keep switch 98 closed with the hope of locking out collector 15 and the game and cost computers 32 and 74 and permitting unrecorded use of the alleys will merely keep relay 103 energized and the contacts 106 and 107 opened.

The employment of relay 103 and its switch comprising the contacts 106 and 107 permits only momentary operation of printing mechanism 96 and of the control relay 68 opening switches 29 and 67. It is, therefore, impossible to lock out collector 15 permanently by inserting a card 97 against contact 99 to close the circuit at 100. Once the relay 103 is energized, contacts 106 and 107 will open to break the circuit of the printing mechanism 96 and then control relay 68 to restore collector 15, the game computer 32 and the money computer 74, whereby collector 15 can immediately continue to operate its sweep arm 20 to pick up frames as they are being rapidly completed by the players on the different alleys. It will be remembered that as each frame is completed, relay 11 of the alley switch will be energized to close its contacts 9 and 10. Contacts 16 and 17 of the respective switches 18 of collector 15 will continue to supply current to the relay coil to keep relay 11 energized and thereby to hold contacts 9 and 10 closed until sweep arm 20 has had an opportunity to close the normally open contact 19 of the switch 18 and transfer the impulse to the common circuit 25 which connects to the game computer 32 by wire 30. Rapid playing by the players on an alley will require collector 15 to be free to operate substantially at all times. Thus, it is desirable to provide the control having relay 103 to assure rapid operation for the printing and at the same time prevent the inserted card 97 being held against switch contacts 99 and 100 in order to keep collector 15 held out and thus allow use of the alleys without operation of the game computer and the cost computer.

From the foregoing description, it will be apparent that the invention is directed to various novel features that are capable of wide application and are not limited in their usefulness to the specific embodiment disclosed.

In its application to bowling alleys, the invention broadly provides operating means adapted to be actuated each time a frame is completed upon any one of the alleys, each alley having as a part of this operating means a device that is held actuated when a frame is completed on the alley, there being a structure to collect the holding action of any or all of the devices and to release these devices which are being held whereby to condition them for subsequent actuation and to operate a computer to record the number of frames played on all the alleys. Collector 15 makes it impossible to play a frame without the frame being recorded because the continuous action of sweep arm 20 of motor 21 clears the switches 18 as rapidly as is necessary to prevent loss of the next frame being recorded on any one alley and also energizes the game computer 32 at the time the switches 18 are cleared. The operation is fast and smoothly performed and it assures proper recording of all frames and a proper computation of the cost of the games.

Without further elaboration, the foregoing will so fully explain the gist of my invention that others may, by applying current knowledge, readily adapt the same for use under varying conditions of service, without eliminating certain features, which may properly be said to constitute the essential items of novelty involved, which items are intended to be defined and secured to me by the following claims.

I claim:

1. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means actuated upon the completion of each frame of any one of a predetermined number of alleys, a collector device associated with all of said means, a stepping device actuated by said collector each time any one of said means is actuated, a cost computer adapted to be operated by said stepping device only after said stepping device has been actu-

ated a predetermined number of times by said collector, and power operated counters adapted to be operated by said stepping device and said cost computer to record the number of games played and the total cost thereof.

2. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means for each alley adapted to be individually actuated upon the completion of each frame of any one of a predetermined number of alleys, a collector associated with all of said means, a stepping device adapted to be actuated by said collector each time any one of said means is actuated, a cost computer adapted to be operated only after said stepping device has been actuated a predetermined number of times by said collector, and power actuated counters adapted to be operated by said stepping device and said cost computer to record the number of games played and the total cost thereof.

3. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means for each alley adapted to be selectively actuated each time a frame is completed upon any one of said alleys, each of said means being actuable independently of the other means, a collector associated with all of said means, a device adapted to be actuated by said collector each time any one of said means is actuated, a cost computer adapted to be operated by said device after a selected number of actuations by said collector, and counter mechanisms to record the number of games played and the total cost thereof, said counter mechanisms being operated respectively by said device and said cost computer.

4. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means adapted to be selectively actuated each time a frame is completed upon any one of said alleys, a game computer, a cost computer, collector means for individually restoring said first means to non-actuated position and to operate said game computer upon each individual restoration, a game counter, said game computer having provisions to actuate said game counter after said game computer has been operated a predetermined number of times and to actuate said cost computer simultaneously with said game counter, means comprising a part of said cost computer producing continued actuation of said cost computer for a predetermined number of steps, and a cost counter actuating a corresponding number of steps each time said cost computer is actuated.

5. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means adapted to be selectively actuated each time a frame is completed upon any one of said alleys, a game computer, a cost computer, collector means restoring said first means and operating said game computer, a game counter, said game computer being operated upon each restoration to actuate said game counter only upon a predetermined number of operations, a cost counter, connections between said game computer and said cost computer to effect actuation of the latter only when said game counter is actuated, and means effecting a continued predetermined number of operations of said cost computer when once it is actuated whereby said cost counter is correspondingly actuated to indicate total cost of games played.

6. Control apparatus for recording the number of frame played in the game of bowling upon a number of alleys and computing the cost thereof comprising means adapted to be selectively actuated each time a frame is completed upon any one of said alleys, a game computer, a cost computer, means to restore said first means and to operate said game computer upon each release, a game counter, said game computer being operated upon each restoration to actuate said game counter only upon a predetermined number of operations, a cost counter, connections between said game computer and said cost computer to effect actuation of the latter only when said game counter is actuated, means effecting a continued predetermined number of operations of said cost computer when once it is actuated whereby said cost counter is correspondingly actuated to indicate total cost of games played.

7. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means adapted to be selectively actuated each time a frame is completed upon any one of said alleys, a game computer, a cost computer, means to restore said first means and to operate said game computer, a game counter, said game computer being operated upon each restoration to actuate said game counter only upon a predetermined number of operations, a cost counter, connections between said game computer and said cost computer to effect actuation of the latter only when said game counter is actuated, means to effect a continued predetermined number of operations of said cost computer when once it is actuated whereby said cost counter is correspondingly actuated to indicate total cost of games played, and means for restricting the period of operation of said deenergizing means to prevent a continued improper locking out of all of said apparatus from computing and recording the number of games played and the total cost thereof.

8. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means adapted to be selectively actuated each time a frame is completed upon any one of said alleys, a game computer, a cost computer, means for restoring said first means and to operate said game computer, there being provisions to actuate said cost computer after said game computer has been operated a predetermined number of times, means comprising a part of said cost computer to effect continued actuation of said cost computer for a predetermined number of steps, and a cost counter actuated a corresponding number of steps each time said cost computer is actuated.

9. Control apparatus for computing the cost based upon a predetermined rate of the number of frames played in the game of bowling upon a number of alleys comprising means adapted to be selectively actuated each time a frame is completed upon any one of said alleys, a game computer, a cost computer, means for restoring said first means and to operate said game computer upon each individual restoration, there being provisions to actuate said cost computer after said game computer has been operated a predetermined number of times, means comprising a part of said cost computer to effect continued actuation of said cost computer for a predetermined

number of steps, a cost counter actuated a corresponding number of steps each time said cost computer is actuated, printing means to effect an impression upon an inserted card of the readings of said cost counter, and means for preventing operation of the aforesaid apparatus during the printing operation.

10. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means adapted to be selectively actuated each time a frame is completed upon any one of said alleys, a game computer, a cost computer, means for restoring said first means and to operate said game computer, there being provisions to actuate said cost computer after said game computer has been operated a predetermined number of times, means comprising a part of said cost computer to effect continued actuation of said cost computer for a predetermined number of steps, a cost counter actuated a corresponding number of steps each time said cost computer is actuated, printing means to effect an impression upon an inserted card of the readings of said cost counter, means for preventing operation of the aforesaid apparatus during the printing operation, and means for restricting the period of operation of said last means to prevent a continued locking out of the aforesaid apparatus from computing and recording the total cost of the games played.

11. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising individual means for each alley each adapted to be selectively actuated each time a frame is completed upon its corresponding alley, a collector for restoring each actuated means to non-actuated position, a cost computer and a counter therefor, connections between said collector and said computer and counter, means interposed in certain of said connections adapted to be actuated by said collector each time one of said selective actuating means is restored, said interposed means effecting actuation of said cost computer after a predetermined number of actuations of said interposed means, said cost counter being actuated upon each actuation of said cost computer.

12. Control apparatus for recording the cost of the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof comprising means adapted to be selectively actuated each time a frame is completed upon one of said alleys, a collector for restoring said alley actuated means to non-actuated position, a cost computer and a counter therefor, connections between said collector and said computer and counter, means interposed in certain of said connections adapted to be actuated by said collector each time said collector restores said alley actuated means to non-actuated position, said interposed means effecting actuation of said cost computer after a predetermined number of actuations of said interposed means, said cost counter being actuated upon each actuation of said cost computer.

13. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys and computing the cost thereof which comprises a plurality of normally open switches, one of which is adapted to be closed when a frame is completed upon one of the alleys, a stepped rotary switching device having a pair of normally closed contacts and a normally open contact for each of said switches, each pair of closed contacts being connected in series with one of said normally open switches, a common circuit for all of said open contacts, means rotatable by said rotary switching device to cause said open contacts successively to engage one of said closed contacts of the respective pairs to receive an impulse therethrough if said normally open switch in series therewith has been closed by the completion of a frame upon one of the alleys, further movement of said rotatable means effecting separation of the said closed pair of contacts to effect opening of said normally open switch in series therewith, a second stepped rotary switching device having a plurality of stations and contacts at certain of said stations, a circuit connection between said common circuit and said second rotary switching device to cause stepping thereof on each pulse imposed upon said common circuit, a counter adapted to be operated each time said contacts of said second rotary switching device are closed, a cost computer actuable by said game computer, and a cost counter operable by said cost computer.

14. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys comprising operating means adapted to be actuated each time a frame is completed upon any one of said alleys, said operating means including a device for each alley, means to hold each device actuated when a frame is completed on its alley, means to determine the state of said devices and to interrupt said holding means whereby to condition them for subsequent actuation, a computer operated by said determining means each time it interrupts the holding means for one of said devices, a counter actuated by said computer, mechanism for printing the reading of said counter, and means temporarily to render said determining means inoperative during said printing operation but to prevent a permanent locking out of the same.

15. Control apparatus for recording the number of frames played in the game of bowling upon a number of alleys comprising relay mechanism, a rotary switch mechanism in circuit with said relay mechanism, a game computer in circuit with said rotary switch mechanism, a game counter adapted to be operated by said game computer, printing mechanism, means for operating said printing mechanism including a circuit adapted to be energized upon each printing operation, a control for disabling said computer during a printing operation, and a second control for limiting the disabling period of said computer.

WILLIAM R. FUNK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,083,839	Kiparski	Jan. 6, 1914
1,221,443	Hall	Apr. 3, 1917
1,653,736	Shackleton et al.	Dec. 27, 1927
1,823,960	Troutman	Sept. 22, 1931
2,071,184	Stewart et al.	Feb. 16, 1937