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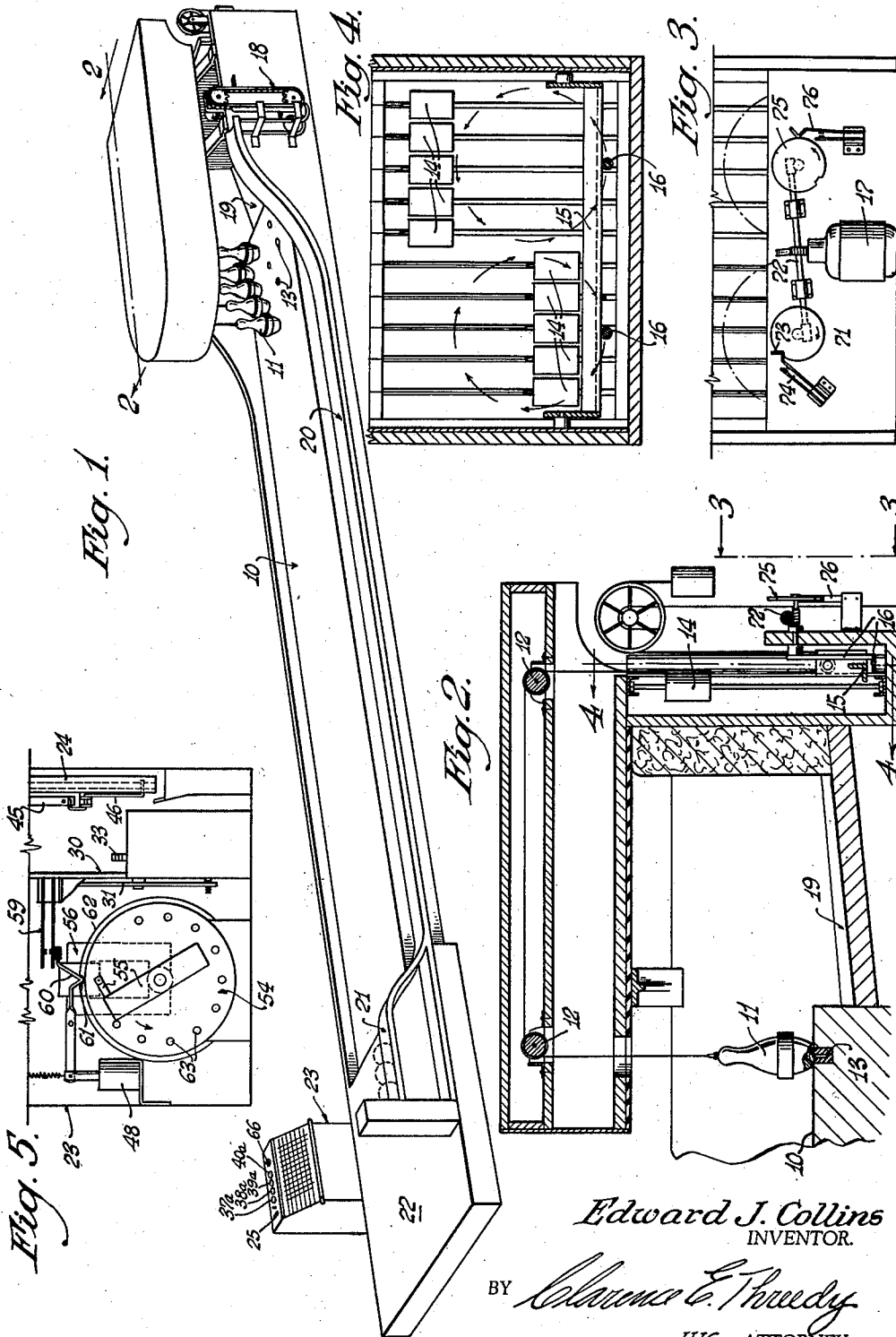
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2,231,255

BOWLING GAME CONTROL CIRCUIT

Filed March 25, 1940

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

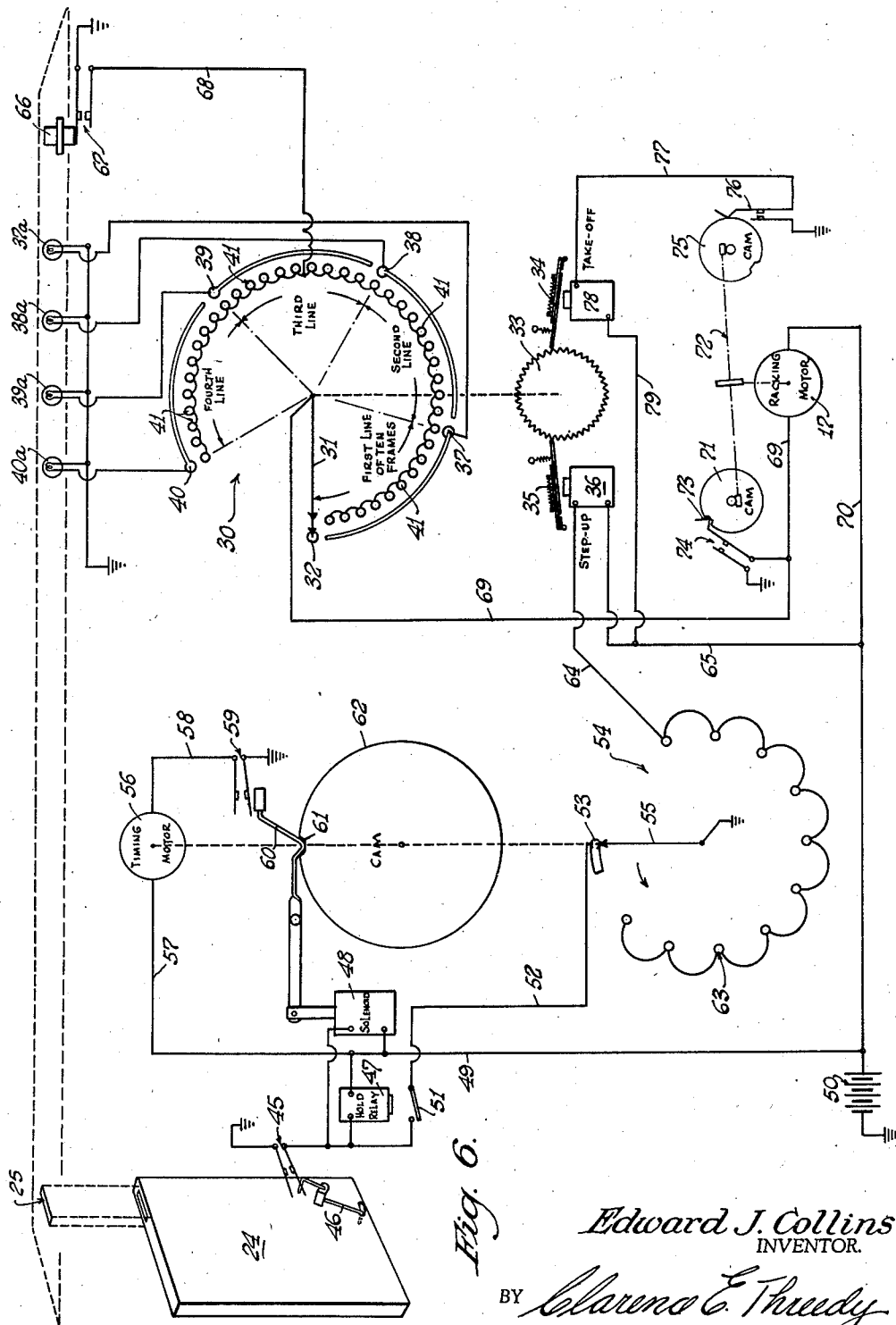


Fig. 6.

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2,231,255

BOWLING GAME CONTROL CIRCUIT

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Application March 25, 1940, Serial No. 325,760

6 Claims. (Cl. 273—37)

This invention pertains to amusement apparatus in the nature of a ball rolling game and has as one of its broad objects the provision of circuit control mechanism operable to condition the machine for a series of operations according to a predetermined scoring plan.

Viewed from another aspect, it is an object of the invention to provide circuit control mechanism including a frame counting stepping switch operable from initial to advanced positions to condition a bowling game for the playing of one or more lines of ten frames each, depending upon the number of coins deposited by the player.

A further object is the provision of electrically operated pin resetting mechanism and switch means operated by the player and coacting with the frame counting switch to initiate a cycle of operation of said resetting mechanism and the stepping of said frame counting switch back toward initial position to subtract one frame responsive to each resetting of the pins.

Yet another object is the provision of novel means for setting or advancing the frame counting switch and including a motor-driven stepping switch actuated by a coin control and operable to advance the main frame counting switch ten steps for each coin deposited, each step corresponding to one frame of play in a bowling game, the ten frames constituting a line, the apparatus being capable of conditioning the game for the playing of one or more lines.

Other objects, advantages and novel aspects of the invention reside in certain details of construction as well as the cooperative relationship of the component parts of the illustrative embodiment described hereinafter in view of the annexed drawings, in which:

Fig. 1 is a perspective view of a coin-controlled bowling alley with which the invention is used;

Fig. 2 is a fragmentary vertical section through the pin resetting means of the alley along lines 2—2 of Fig. 1;

Fig. 3 is a fragmentary horizontal section along line 3—3 of Fig. 2 showing the resetting motor;

Fig. 4 is a fragmentary vertical section through the pin counterweights and resetting means;

Fig. 5 is a fragmentary elevational detail of the setting switch for the frame counting switch;

Fig. 6 is a circuit diagram.

Referring to Fig. 1, the invention is employed in conjunction with a bowling alley 10 provided with a plurality of tethered pins 11 suspended by overhead pulley means 12 (Fig. 2) in positions above releasable holding means in the form of permanent magnets 13 adapted to hold the several

pins in properly spotted positions on the pin bed of the alley. Each pin is provided with a counterweight 14 adapted to raise the pin abruptly from the alley when struck by the bowling ball.

In order to restore the several pins from raised to lowered or spotted position on the alley, there is provided a horizontal lift bar 15 (Fig. 4) underlying all of the counterweights 14 and arranged to be elevated by cam means 16 driven by a motor 17 (Fig. 3), the magnets 13 being effective to hold the pins in lowered condition against the raising effort of the corresponding counterweights.

The game is also provided with an automatic ball return including a motor-driven elevating device 18 (Fig. 1) which receives the spent balls from a transverse return alley 19 (Figs. 1 and 2) and delivers the same to a return alley 20 arranged to align the balls in an elevated portion 21 thereof for convenient access to the player at the platform 22 of the alley.

The present game is preferably arranged for coin-controlled operation, and to this end there is provided a control cabinet 23 at the side of the platform, and including a coin testing device or chute 24 (Fig. 6) into which coins may be deposited through an opening 25 in the top of the control cabinet to set certain control mechanism into operation and effect a clearing of previous scoring indications and a resetting of pins 11.

The control circuit means and mechanism is best illustrated in Fig. 6 and includes a frame counting switch generally indicated at 30, this switch preferably being of the rotary step-by-step variety including a stepping wiper contact arm 31 adapted to start from an initial position or contact 32 and step successively into engagement with a plurality of circularly arranged contacts. Such stepping switches are well known in the art and may include spring means (not shown) tensioned by the stepping or advancing movement of the wiper arm and cooperating with ratchet means 33 and a releasing pawl 34 operable to free the moving element of the switch for restoration of the ratchet and contact arm to initial or starting position, connection between the contact arm or wiper 31 and the ratchet 33 being indicated in Fig. 6 by the dotted line.

Stepping action of the frame counting switch is preferably effected by oscillation of a stepping pawl 35 which is attracted by a stepping magnet 36 energized or impulsed in a manner hereinafter to be described.

A feature of the invention is the connection

of the frame counting switch to condition the apparatus for the playing of a succession of games in accordance with some predetermined scoring plan, as for example, the playing off of one or more lines in a bowling game wherein each line may be said to constitute a complete game in itself, there being ten complete operations of the game apparatus in each line played, each of the ten individual operations being designated in bowling parlance a frame, and the playing of each successive frame requiring a resetting or reconditioning of the game apparatus, as by restoring any struck or elevated pins to properly spotted condition on the pin bed.

The foregoing arrangement of the control or frame counting switch is such that the wiper 31 is advanced from its initial position or contact 32 to an advanced position or contact 37 or to any one of the still farther advanced positions or contacts 38—39 or 40, there being nine serially connected contacts 41 disposed between each of the main contact positions 32—37 . . . 40 for controlling the stepping operation of the switch in subtracting the frames of play one by one. Thus, the contacts 32 to 37 and the intervening serially connected contacts 41 constitute a region of control corresponding to one line of play, and each of the advanced or line indicating contacts 37, 38, 39 or 40 is connected respectively to energize a corresponding line indicating lamp 37a, 38a, 39a, 40a situated on the top of the control cabinet 23 to apprise the player of the number of lines to be played.

When the player approaches the game and deposits a coin in the chute 24, setting mechanism is put into operation to impulse the step-up magnet 36 and advance the wiper 31 at least to the contact 37 to permit one line of play, deposit of additional coins actuating the setting mechanism to advance the wiper or contact arm 31 correspondingly to contacts 38, 39, etc.

This setting mechanism includes a master operating switch 45 arranged for operation by a lever 46 moved by a coin deposited in the chute 24, one terminal of the switch being grounded and the other terminal being connected to one terminal of a holding relay winding 47 and one terminal of a cam switch solenoid 48, the other terminal of which is connected, as is the remaining terminal of the relay 47, to a common battery or power conductor 49, the return connection to the battery 50 being grounded. Thus, closing of switch 45 by a coin will energize the holding relay winding 47 and solenoid 48, the holding relay closing its own locking circuit through contact 51 which is connected by conductor 52 to a starting terminal 53 on the setting or impulse switch generally indicated at 54. The wiping contact arm 55 of the setting switch is grounded so that when the holding relay 47 is initially impulsed through the coin switch, ground will be connected through wiper 55, starting contact 53, conductor 52 and relay contact 51 to the grounding terminal of the relay winding, this circuit holding up after switch 45 is opened until the setting or impulsing switch 54 steps its wiper 55 away from starting contact 53.

The setting or impulsing switch 54 is actuated by a timing motor 56, one terminal of which is connected by conductor 57 to the common power connection, and the other terminal of which is connected by conductor 58 to one contact of a cam switch 59 (Fig. 5 also) which has a companion and normally open contact grounded.

When the cam switch solenoid 48 is energized as

aforesaid, switch 59 is closed by the riding arm 60, thus connecting ground to the timing motor so that the latter begins to run. The riding arm 60 is provided with an offset 61 which fits into a notch in a cam disc 62 permitting the arm 60 to drop and open switch 59 when the notch in the cam disc moves into engagement with the offset 61 to stop the motor. The cam disc 62 and the contact arm 55 of the impulsing switch are all connected as indicated by dotted lines to be driven by the motor 56. Thus, a momentary closing of switch 45 energizes the solenoid 48, closing switch 59, and the motor 56 starts, displacing the notch in the cam disc from engagement with the offset 61, which thereafter rides on the periphery of the disc, holding switch 59 closed until the disc makes a complete revolution.

As the wiper 55 of the impulsing switch is rotated by operation of motor 56, it moves successively into and out of engagement with ten contacts generally indicated at 63 and connected in series to a conductor 64 leading to one terminal of the step-up coil 36, the other terminal of this coil being connected by conductor 65 to the common battery or power connection so that as wiper 55 moves into and out of engagement with the ten contacts 63, the coil 36 will be energized ten times, resulting in ten stepping operations of the ratchet 33, with a corresponding movement of wiper 31 of the frame counting switch from its initial or starting contact position 32, wiper 31 stopping on the first advanced-position contact 37 if only one coin has been deposited in the chute 24, and lamp 37a thereby being illuminated on the control cabinet.

The player may then reset the pins by pushing a button 66 on the control cabinet (Fig. 1) which operates a master resetting switch 67 (Fig. 6) connecting ground via conductor 68 to all of the serially connected contacts 41 on the line indicating or stepping switch and thus connecting ground to the wiper 31 which in turn is connected by a conductor 69 to one side of the resetting motor 17, the other side of which is connected by conductor 70 to the common power connection, so that the resetting motor 17 is started through a cycle of operation to reset the counterweights and pins by raising the cross bar 15 as heretofore explained.

The resetting operation is cyclic in that the resetting bar 15 is raised and lowered for this purpose, and the motor 17 is automatically shut off when the resetting bar 15 is restored to lowered position, this being accomplished by a cam disc 71 (Fig. 3 also) drivingly connected through shaft 72 with the motor 17 and provided with a peripheral notch engaged by the offset 73 on a locking switch 74. As soon as the motor starts following operation of the push button master switch 66—67, disc 71 is rotated far enough to displace the peripheral notch and cause the offset 73 to ride on the periphery of the disc, closing switch 74 and connecting ground to conductor 69, thus providing a locked energizing circuit for motor 17, this circuit opening automatically when the notch in the disc comes around into engagement again with the offset 73.

Means is provided for subtracting or stepping off the frames of each line following each operation of the master resetting means 66—67, this being accomplished by the provision of subtracting cam switch means 75—76 identical in construction with the switch 71—74 and operating in the same manner (see Fig. 3) to connect ground via conductor 77 to one terminal of the

take-off or subtracting magnet 78, this coil receiving power via conductor 79 from the common power connection.

Operation

Assuming that the player approaches the game in the condition in which it is shown in Fig. 1 wherein some of the pins have been struck and removed from the pin bed, he may condition the game by depositing one five-cent coin, for example, in the opening 25 in the top of the control cabinet 23, and assuming the coin is acceptable, it will be guided by the testing chute 24 into engagement with the switch operating arm 46, momentarily closing switch 45, which simultaneously energizes relay 47 and the cam switch solenoid 48. Relay 47 closes its own locking circuit for the time being through its contact 51, and solenoid 48 raises the cam arm 60 to close the setting switch 59 which starts motor 56 for a cycle of operation determined by the length of time it takes the disc 62 to bring the notch around to the offset 61 again.

Operation of the setting motor 56 as aforesaid causes the wiper 55 of the impulsing switch to wipe over the bank of series contacts 63 with a resultant impulsing of the stepping coil 36 ten times. As soon as wiper 55 leaves the starting contact 53, the holding circuit through contact 51 for the holding relay is broken and the latter drops back.

Impulsing of the step-up coil 36 as aforesaid steps the ratchet disc 33 with a corresponding stepping of the frame counter wiping arm 31 away from its initial position 32, the wiper coming to rest in an advanced position on the first line indicating contact 37 with a consequent illumination of the first line indicating lamp 37a atop control cabinet 23.

If the player desires, he may deposit another coin and advance the frame counter wiping arm 31 to a second advanced position to contact 38, causing the second line indicating lamp 38a to be illuminated. As shown, the frame counter and associated mechanism is capable of setting up four lines for play, there being the customary ten frames to each line.

When the player observes one of the line counter lamps to be illuminated, he knows that the circuit control mechanism is in condition to start the pin resetting means and he depresses button 66, closing switch 67 to connect power momentarily to the pin resetting motor 17 via conductor 68, the bank of intermediate or frame contacts 41, the frame counter wiper 31, and conductor 69. Starting of motor 17 closes cam switch 74 for the duration of a complete resetting cycle which results in a reciprocation of the bar 15 to restore the pins to the alley.

Each time the player operates the master resetting switch 66—67, one of the permitted frames of play will be subtracted, this being accomplished by the closing of the subtracting cam switch 75, which impulses the take-off or subtracting coil 78 via conductor 77 to release the holding pawl 34 and permit the frame counter wiper to move back one step toward initial position by its restoring spring means.

The various advantages and objects of the invention may be accomplished by modifications of the particular embodiment specifically described herein, and it is intended that the appended claims shall include all equivalent arrangements fairly coming within their call.

Having thus described my invention, what I

claim as new and desire to protect by Letters Patent is:

1. In a bowling game including pin resetting motor mechanism, a control circuit including a frame counting stepping switch, electrically controlled means for moving said switch from an initial to an advanced position ten steps at a time, means operated by a player and connected for control by said stepping switch to start said motor mechanism provided the stepping switch is in an advanced position, and means coacting with said motor mechanism for restoring said stepping switch one step at a time back toward initial position upon each resetting operation of said motor mechanism.

2. In a bowling game, in combination, a step by step frame counting switch and electrically controlled mechanism for stepping the same in opposite directions relative to an initial and an advanced position, means controlled by a player for actuating said electrically controlled stepping mechanism to move said switch from initial to advanced position, means controlled by a player for actuating said electrically controlled stepping mechanism to return said frame counting switch one step at a time back toward initial position, and pin resetting mechanism including a resetting motor and circuit connections therefor operable when the motor is started to maintain the motor in operation for the duration of one complete resetting cycle of said resetting mechanism, restoring switch means coacting with said motor for operation once during each resetting cycle of operation thereof to actuate said electrically operated restoring means.

3. In a bowling game, the combination with a pin resetting motor of control and frame counting means including a stepping switch arranged to be stepped from an initial to an advanced position, a second stepping switch connected for operation to step said first stepping switch to an advanced position, electrically operated restoring mechanism coacting with said first stepping switch and operable to step the latter in a succession of steps back toward said initial position, switch means controlled by a player and connected for cooperation with said first-mentioned stepping switch to start said motor for a cycle of pin resetting operation, locking switch means coacting with said motor to lock an operating circuit therefor for the duration of one cycle of resetting operation upon starting of the motor as aforesaid, and switch means operably controlled by said motor for actuating said restoring mechanism once during each cycle of resetting operation of the motor.

4. In a control circuit for a bowling game of the type which includes a pin resetting mechanism, the combination of a stepping switch and electrically operated stepping means therefor arranged for operation to advance said switch a certain number of steps from an initial position to a starting position, electrically controlled take-off means cooperable with said switch to effect movement of the same in steps from said starting position back toward said initial position, means controlled by a player for actuating said electrically controlled take-off means, means controlled by a player for actuating said first-mentioned electrically operated stepping means to advance the stepping switch, and an electrically operated means controlled by said stepping switch to operate said pin resetting mechanism for a certain length of time.

5. In a bowling game of the class described, in combination, a frame counting switch provided

- with a succession of counting contacts, said counting switch including a movable contact, electrically operated means for moving said movable contact in one direction to an advanced position, a second electrically operated means for effecting movement of said movable contact in an opposite direction away from advanced position, means actuated under the control of a player for energizing said first-mentioned movable contact advancing means desired amounts from initial position, electrically operated pin resetting means, a resetting switch connected for co-operation with said frame counting switch to operate said resetting means, and a subtracting switch operated by said resetting means once during each resetting operation thereof to actuate said second-mentioned electrically operated means for moving the movable contact one step back toward initial position.
6. In a bowling game including pin resetting mechanism, the combination of frame counting and resetting means including a resetting motor and cyclically operable switch means coacting therewith to maintain the motor in operation for the duration of a resetting cycle after the motor has been started by other means, a frame counting switch including a movable contact adapted to move in opposite directions between a normal position and an advanced position, means under the control of a player for moving said contact to advanced position, means under the control of a player and said frame counting switch for starting said motor provided said frame counting switch is in an advanced position, and master resetting means operably controlled by said motor for restoring said frame counting switch in successive steps toward normal position one step for each resetting operation of the motor.
6. In a bowling game including pin resetting

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