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H. E. WILLIAMS ET AL

2,266,932

HIGH SCORE RECORDER

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Fig. 1.

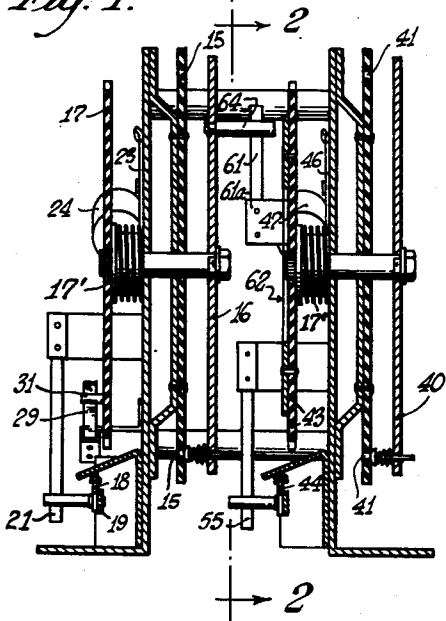


Fig. 2.

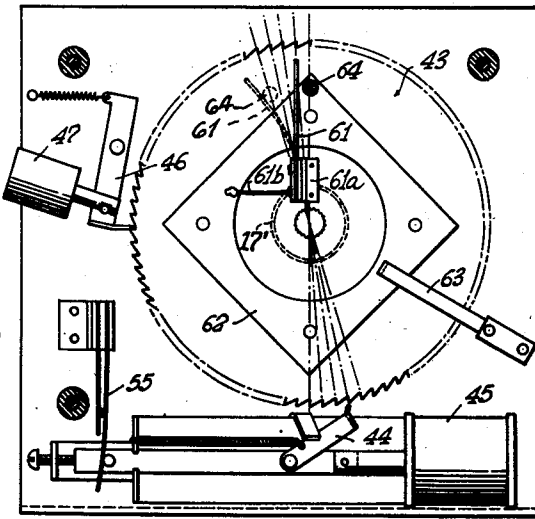
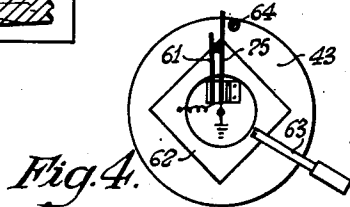
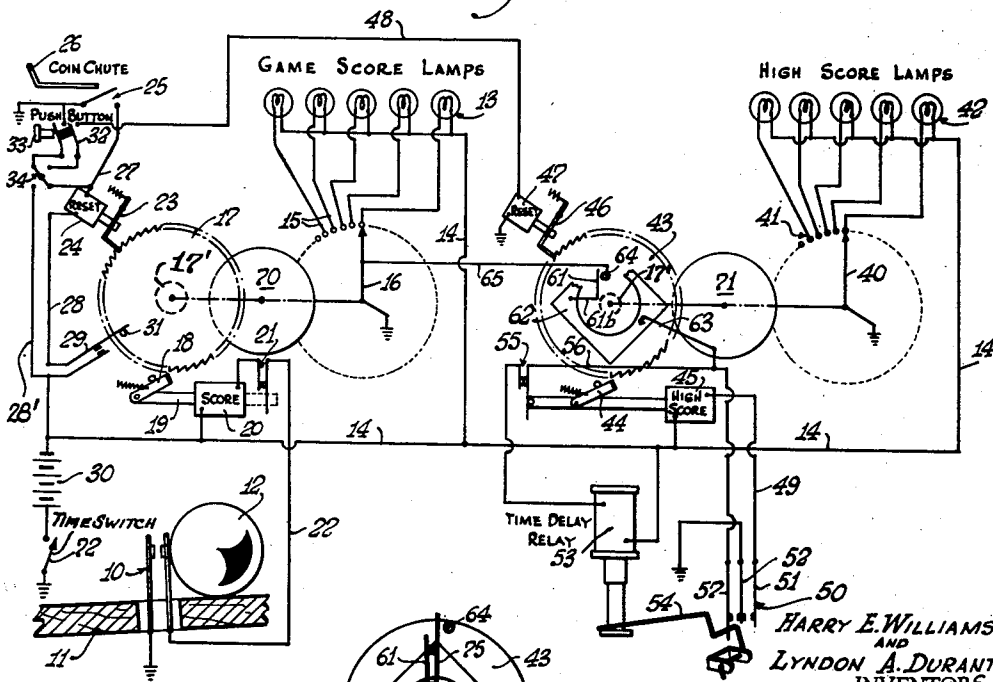


Fig. 3.



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HIGH SCORE RECORDER

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6 Claims. (Cl. 177-384)

This invention relates to improvements in electrically operated score indicating, registering and recording means for use in amusement apparatus, one of the principal objects being the provision of high score recording means arranged so as to give an indication of the highest score attained in any previous playing of a game.

Viewed from another aspect, it is an object of the invention to provide a score indicating means including a score indicating switch coacting with a high score registering switch in such manner that the high score switch is advanced to indicate a new high score each time the regular score switch exceeds any previously achieved score.

A more particular object is the provision of an ordinary score indicating or registering stepping switch for coacting with a high score indicating or registering switch, together with an intermediate linking switch operably controlled by the ordinary score switch, which is adapted to be operated by a switch actuated as a result of playing a game, so that the first score registered by the ordinary score switch in playing the first game of a series will be stored in the high score registering switch, and in order to advance the latter to indicate a new high score it is necessary that the ordinary score switch be advanced in excess of any previously achieved score.

Yet another object is the combination of two or more rotary stepping switches arranged for coaxially stepping operation with a first switch adapted to be stepped from an initial position each time a game is played, and a second stepping switch adapted to be continuously advanced under the control of or in cooperation with the first switch, provided each successive operation of the latter from initial condition produces an advance in excess of any previous advance.

The foregoing specific arrangement of the stepping switches is further characterized by the fact that the stepping switches are electrically impulsed and there is included in the combination an intermediate linking switch moved with the second stepping switch relative to an actuating element which is in turn moved by the first stepping switch, the arrangement being such that the linking switch must be closed first by operation of the first stepping switch before the second stepping switch can be actuated, the linking switch being advanced to a new position by each successive operation of the first stepping switch from its initial position, provided any subsequent advance of the first stepping switch is in excess of a previous advance thereof from initial position to render the linking switch oper-

able for the purpose of actuating the second stepping switch.

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 drawing, in which:

Fig. 1 is a vertical cross section through the coaxially arranged stepping switches;

Fig. 2 is a section on the line 2-2 of Fig. 1, showing the high score switch;

Fig. 3 is a circuit diagram;

Fig. 4 is an elevational view to reduced scale of a modified form of linking switch.

The invention is best described in its broader aspects in view of the circuit diagram of Fig. 3, wherein the score control switching mechanism has been arranged for control by a game switch 10 arranged on a ball playing board 11 for actuation by a game instrumentality such as a ball 12 which is adapted to gravitate against switch 10 and close a scoring circuit.

Associated with the game are a plurality of game score lamps generally indicated at 13, these lamps being energized successively by operation of a switch or switches like the game switch 10, to give an immediate indication to the player of his score.

The game score lamps each have one of their terminals connected to a common battery or power supply conductor 14, while the remaining terminal of each lamp is connected to one of the contacts 15 of a first or ordinary game score switch of the step-by-step rotary variety which includes a wiping contact 16 connected to ground to complete a circuit with the remaining grounded terminal of the battery or power supply for any of the game score lamps when the wiping contact 16 is stepped successively into engagement with the several lamp bank contacts 15.

The stepping operation of the ordinary or game score switch is effected through the step by step movement of a cooperating ratchet disc 17 which is advanced in steps from an initial position by reciprocation of a driving pawl 18 and the associated plunger 19 of a score switch solenoid 20. Solenoid 20 is intermittently impulsed through its own normally closed breaker switch 21 and a conductor 22 which is grounded by the game switch 10 whenever the player scores, as by causing ball 12 to engage and close the game switch. Solenoid 20 is stepped one or more successive times depending on the duration of the contact of the ball upon switch 10. With-

out a breaker switch such as the switch 21 there would be no successive steps but the solenoid 20 would remain energized as long as the ball switch 10 is closed. When plunger 19 is attracted into the dotted line position, the breaker switch 21 deenergizes solenoid 20 and permits the stepping pawl 18 to restore to normal position. Thus, each energization of solenoid 20 will cause the ratchet disc 17 to advance one step, this movement being communicated through a linkage indicated by the dash-dot line to the wiper 16 which is advanced a corresponding amount from an initial position. The ratchet 17 is held in advanced position during each game by action of a pawl 23 normally engaging the ratchet teeth, but moved into ineffective position when its associated reset solenoid 24 is energized.

Resetting of the ordinary or game score stepping switch is accomplished automatically at the start of each new game by closing of a master control switch 25 adapted to be operated by the player in conjunction with a master control device such as a coin chute operating member 26, which the player must operate at the beginning of each new game. Switch 25 connects ground to one terminal 27 of the reset solenoid 24, the other terminal of which is connected by a conductor 28 through a supervisory switch 29 to one side of the battery or power source 30. Switch 29 is normally held open by a pin 31 on ratchet disc 17 when the latter is in its initial position, the purpose of this being to render the master switch 25 ineffective and avoid useless energization of the reset solenoid 24 in the event the game score switch is already in normal or initial position at the time the player approaches the game. Also arranged to reset the score stepping switch is a proprietary control switch 32 adapted to be operated by a push button 33 conveniently concealed about the game in a place known only to the proprietor, this switch being connected through a selecting switch 34 to battery through the conductor 28 and supervisory switch 29, the arrangement being such that the proprietor may close switch 32 by pushing button 33 to energize solenoid 24 and release the ratchet 17 for restoration by a spring means 17' associated therewith in accordance with constructions well known to those skilled in the art. As in the case of the master switch 25 operable by the player, the proprietary switch 32 is rendered ineffective by the supervisory switch 29 in the event the stepping switch, and particularly the ratchet disc 17, is already in its initial position.

Thus, the player, as a result of playing the game to actuate the game switch or switches 10, will cause the stepping switch to advance the wiper 16 and successively energize the score indicating lamps 13. In order to indicate to each succeeding player the highest score achieved in any preceding play, there is included in the score control circuit a high score stepping switch identical in most of its structural aspects to the game score stepping switch in so far as the high score switch likewise includes a wiper 40 movable in steps relative to a series of lamp contacts 41 each connected to one of a corresponding series of high score lamps 42 to energize the latter upon advancing movement of the wiper. The high score stepping switch is advanced under the control of the score stepping switch and advances a number of steps determined by the position of the wiper 16 but wholly independent of the stepping operation of the score stepping

mechanism. The high score wiper is advanced in steps by a ratchet mechanism including a ratchet disc 43 stepped by a pawl 44 reciprocated by a solenoid 45 and adapted to be reset from any advanced position upon retraction of its locking pawl 46 responsive to energization of a cooperating reset coil 47 through a conductor 48 and the proprietary switch 32 and by way of the conductor 28' to the battery 30. The resetting of the ratchet 43 follows the resetting of the score ratchet 17 for reasons to become more apparent later.

The high score stepping switch solenoid 45 has one of its terminals connected to the common battery or power conductor 14 and its remaining terminal connected by a conductor 49 to a normally open contact 51 on a time delay switch generally indicated at 50. Closing of the latter switch connects ground through a conductor 52 to the solenoid, thus energizing the latter. The time delay switch 50 is electrically operated by a slow-releasing solenoid 53, the plunger of which pivots an arm 54 to close the spring contacts of switch 50. Solenoid 53 has one of its terminals connected to the common power conductor 14 and its other terminal connected to a normally closed breaker switch 55, similar to the breaker switch 21 heretofore explained. This breaker switch 55 opens upon movement of the pawl mechanism 44 whenever the switch is stepped, this breaker switch being connected by a conductor 56 to a contact spring 57 on the time delay switch 50 for connection to ground through contact 52 to provide a momentary locking circuit for the slow-releasing solenoid 53 when the same has been energized to close the switch 50 and the several contacts thereof upon the last or high score step, that is on the step during which the two stepping mechanisms became equalized in a manner later to be described. One of the features of the invention resides in the provision of an intermediate linking switch, one terminal contact element 61 of which is connected to a contact ring 62 on the ratchet disc 43 for engagement with a wiping contact 63 connected by conductor 58 to a breaker switch 55. A laterally extending pin 64 carried by the contact 63 is adapted to engage the contact element 61 and constitutes the remaining contact 64 of the linking switch which is connected by a conductor 65 to the grounded wiper 16 of the first or game score stepping switch. Linking switch contacts 61 and 64 are normally open, but as soon as they are closed, ground is connected through the breaker switch 55 to the slow-releasing solenoid 53 for the purpose of energizing the high score stepping solenoid 45 through the time delay switch 50. In the operation of these two stepping switches the score switch will advance quite rapidly to the point of biasing contact 61 as seen in Fig. 2 whereas the advance of the high score switch will follow in uniform and positive steps until the two score mechanisms are equalized with the contact pin 64 out of engagement with the contact spring 61.

The intermediate linking switch means 61-64 is so arranged as to be actuated by the first or game score stepping switch, the linking switch being mounted for movement out of operative engagement with the game score switch each time the high score switch is energized for advancement to a new high score position. Before the linking switch can be closed upon a playing of the next game, the game score switch

must be advanced one step beyond its previous position of advance in the preceding game, whereupon the high score stepping switch will likewise be advanced one additional step in excess of the previous high score indicating position, such additional or subsequent advance of the high score switch to its new position opening the intermediate linking switch 61—64, the new score being appropriately indicated by illumination of one of the lamps 42 as determined by the position to which wiper 40 has been advanced by the high score stepping ratchet mechanism.

This locking circuit is broken by the breaker switch 55 as soon as the high score solenoid 45 pulls up. However, since it is of the slow-to-release type, the plunger of solenoid 53 is not immediately dropped and switch 50 is momentarily held closed to assure a proper energization of the stepping solenoid 45. Ordinarily the breaker or interrupter switch 55, functioning as does the breaker switch 21 of the score unit, would be sufficient to accomplish a step-by-step rotation of the ratchet wheel 43 through the solenoid 45 and its associated parts. However, since the operation of the high score unit depends upon the score unit and is conditioned for operation by the latter through the link switch 61—64, it is apparent that if the interrupter switch 55 were slightly out of adjustment, the ratchet wheel 43 would not be advanced sufficiently to complete a full step of the latter, and by reason thereof the solenoid 45 would be intermittently operated indefinitely without effecting an advance of the ratchet 43. In the case of the score unit the solenoid 20 thereof is dependent for its operation upon the momentary closing of the switch 10 by a ball; there being no danger of a constant intermittent operation of such solenoid 20 it has been found that the breaker switch 21 is sufficient, and that no time delay need be employed in its circuit. It is also to be noted that in order to assure a final step of the ratchet 43, that is the step required to sever connection between the contact element 61 and the contact pin 64, there is required some means for maintaining the electrical circuit to the solenoid 45. It will be noted that at that particular moment the circuit to ground through the wiping contact 63 will be broken at the contacts 61—64 before a complete step is made by the ratchet 43, but that by reason of a ground connection established through these contacts 61—64 the time delay relay 53 will be initially operated and thus the ground circuit positively established through the locking switch 57 prior to the time that circuit is broken through the breaker switch 55, otherwise the pawl 44 of the solenoid 45 would merely rock back and forth upon the opening and closing of the breaker switch 55 without advancing the ratchet 43 a full step thereby defeating the purpose of the stepping mechanism. It is therefore seen that the locking circuit 57 acts as an intermediate switch which assures energization of the solenoid 45 for a duration of time sufficient to make a full step on the ratchet 43 despite the fact that the contacts 61—64 become severed prior to that complete step.

In Fig. 2 is shown, in elevation, the intermediate linking switch mounted for movement with the ratchet disc 43 of the high score stepping switch. The contact 61 is preferably a leaf spring mounted on a bracket 61a and connected by a jumper 61b to the wiper plate 62. The re-

maining contact 64 of this linking switch is the pin 64 as was heretofore explained (Fig. 1 also) projecting from the grounded wiper arm 16 on the first stepping switch.

The two stepping switches are arranged in side by side or tandem relation, as shown in Fig. 1, so that the stepping ratchets 17 and 43 thereof are aligned for coaxial movement. When both ratchet discs are in initial position, the contact pin 64 is one step removed from being in circuit closing engagement with the other intermediate linking switch contact 61, and it is therefore necessary to move the first or score switch ratchet disc 17 one step to bring pin 64 into contact with the spring 61 in order to close an energizing circuit to effect a corresponding advance of the high score stepping switch. As soon as the latter switch steps once, the contact spring 61 is removed a distance of one step from engagement with pin 64. If now the first or score stepping switch be returned to initial position, it will be necessary upon the next play to step this switch twice before the intermediate linking switch contacts 61 and 64 can again be closed for a repetition of the foregoing operations to advance the high score switch to a new high score indicating position. From this it will be apparent that it is necessary for the player to cause the ordinary score indicating switch to advance at least one step beyond the position occupied thereby in any preceding play if the high score indicating switch is to be advanced one or more steps to a new position.

Each time the game is released for play by the patron in operating the master control means or coin chute 26 and the associated master switch 25, the game score switch is restored to an initial zero position in which none of the lamps 13 will be illuminated. However, one of the high score indicating lamps presumably will be illuminated to apprise the player of the score previously set up by him or some preceding player and to provide an objective and an incentive to achieve that objective and set up a new one.

It will have been observed that high score switch is not restored to a zero position each time the regular score switch is restored, since the high score switch must, of course, be left in its newly advanced positions after each play if it is to store or register any previously attained high score and indicate the same to the subsequent player. However, the proprietor may restore the high score switch to a zero position at any time arbitrarily or when the switch has reached the limit of its advanced movement unless the switch be arranged for continuous unidirectional motion, which it may be within the intent and scope of this disclosure. To this end, the proprietor, after having restored the game score ratchet disc 17 to initial or zero position, has merely to turn the selecting switch 34 to connect conductor 28' with conductor 48, thereby energizing the high score reset coil 47. The ratchet 17 must be returned to zero position first otherwise the linking switch 61—64 will be effected to operate the solenoid 45.

In Fig. 4 there is shown a modified arrangement of the linking switch characterized by the fact that there is an additional switch blade 75 arranged in normally open circuit relationship with the contact 61 and positioned to be engaged by the pin 64 for movement into closed circuit engagement with contact 61 to energize the time delay relay solenoid 53, the switch blade 75 pref-

erably being grounded on the shaft of ratchet disc 43. In the arrangement of Fig. 2, the circuit is closed between switch contact 61 and pin 64 which constitutes the operating means in this latter arrangement in so far as it operates to place ground on the companion switch part 61.

It is also contemplated that the indication afforded by the banks of lamps 13 and 42 may be supplemented by indicating dials 70 and 71 respectively associated with the game score switch and high score switch for the purpose of affording an indication when the lamps 13 or 42 are extinguished during idle periods of the game, since the circuit arrangement preferably includes a conventional time switch 72 in the power circuit to disconnect the power source after a predetermined lapse of time whether the player has finished his game or not. This time switch 72 is of a conventional and well-known structure and is set into operation upon inward movement of the coin chute 26 by engagement with the latter, and renders the circuit from the battery 30 to ground complete for a predetermined lapse of time.

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 our invention, what we claim as new and desire to protect by Letters Patent is:

1. In an amusement apparatus including a game switch arranged to be operated as an incident to the operation of said apparatus, score registering means comprising, in combination, an electrically operated game score switch of the type which moves step by step from a starting position to effect circuit connections, indicating means connected to be energized by said game score switch, means for returning said game score switch to a starting condition with each playing of a game, and means for indicating the highest score indicated by said game score switch in a given series of operations thereof from said starting condition, said last-mentioned means including an electrically operated high score stepping switch and an intermediate linking switch moved thereby relative to said game score switch and cooperating with the latter to actuate the high score switch whenever the game score switch moves an amount from starting condition which is in excess of the movement thereof in a previous advance from starting condition.

2. In a score registering mechanism, in combination, a rotary stepping switch adapted to be moved step by step from a starting position in indicating a score, means on said stepping switch for indicating a score, a second stepping switch mounted to step coaxially of the first switch, means on said second stepping switch for registering a high score, electrically operated means for stepping the second switch, a linking switch mounted for movement with a rotary moving part of the second switch opposite a coaxially displaced part of the first switch, said linking switch being connected for operation to energize the second stepping switch, and a link switch operating member mounted for movement with a rotary moving part on the first switch and arranged to operate the linking switch whenever the first stepping switch is moved a sufficient distance from a starting position to operatively engage the linking switch, said second switch being stepped by operation of the linking switch

to move the latter out of operative engagement with said operating member, and means for returning said first stepping switch to said starting position.

3. In a score switching mechanism, rotary stepping switches including coaxially moving parts, means for stepping a first one of said switches from a starting position, score indicating means arranged to be effected by the stepping of said switch to indicate a score, means for returning said switch to starting position, electrically operated means for stepping a second one of said switches in the same direction as said first switch, indicating means associated with said second switch and adapted to indicate a high score, and an operating link switch connected for operation to energize said operating means for the second stepping switch and mounted to move with one of the coaxially moving parts of one of the stepping switches for rotary displacement with respect to one of the coaxially moving parts of another stepping switch and in a direction away from said starting position, and an operating member for said link switch mounted for rotary displacement with respect to the latter on a coaxially moving part on the other one of said stepping switches such that movement of the latter switch different amounts from said starting position will cause said operating member to be advanced into operative engagement with the link switch to actuate the latter and cause movement of the other stepping switch to withdraw the link switch from operating engagement with said operative member.

4. In a score control switch apparatus, electrically operated stepping switches arranged to step in the same direction from a starting position, each of said stepping switches having means for indicating a score commensurate with the number of steps made, a link switch mounted for movement with one of said stepping switches, link switch operating means mounted for movement with the other stepping switch, said other stepping switch being movable from starting position to engage and actuate said link switch, said link switch being connected for actuation to energize the stepping switch with which it is movably associated, the arrangement being such that said first stepping switch will have to be stepped increasing amounts from starting position with each successive stepping operation thereof away from said position in order to engage and actuate said link switch.

5. Switch means for use in a game apparatus to register the highest score achieved in a series of successively played games, said mechanism including a pair of switching devices progressively movable in the same direction from a starting position, electrically energized means for moving said switching devices, means arranged to move with each of said switching devices to indicate a score and coaxing link switch means mounted for movement each with respect to the other on said switching devices and including a switch element adapted to energize the second one of said devices when the first device is moved from a starting position whereby to move said second device continuously by amounts corresponding to the greatest movement of said first device from starting position during a succession of operations thereof.

6. In a score register mechanism, in combination, a rotary stepping switch adapted to be moved step by step from a starting position in effecting score indicating connections, means arranged in circuit with said connections to indi-

cate a score, a second stepping switch mounted to step coaxially of the first switch, high score indicating means energized by said second stepping switch, electrically operated means for stepping said second switch, and means providing a linking switch including a contact element mounted for movement with a rotary moving part of the second switch, and a companion contact element mounted for rotary displacement on the first stepping switch coaxially of the movement of said first-mentioned contact element, said first-mentioned contact element and said companion contact element being connected to close an energizing circuit when in contact with

each other to energize said electrically operated means for stepping the second switch, stepping action of said second stepping switch withdrawing said first-mentioned contact element from circuit closing engagement with said companion contact element, means for restoring said first-mentioned stepping switch to starting position, whereby said first stepping switch must be stepped an increasing number of times after each restoration to starting position in order to effect movement of the second stepping switch to a newly advanced position.

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