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SELECTIVELY OPERABLE BALL GATE AND SWITCH MEANS

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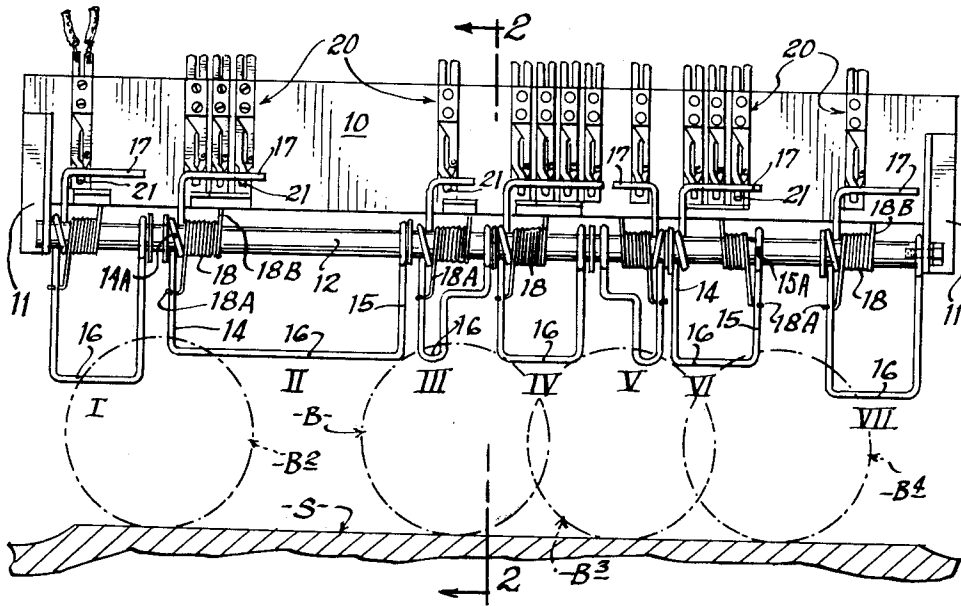


FIG. 1

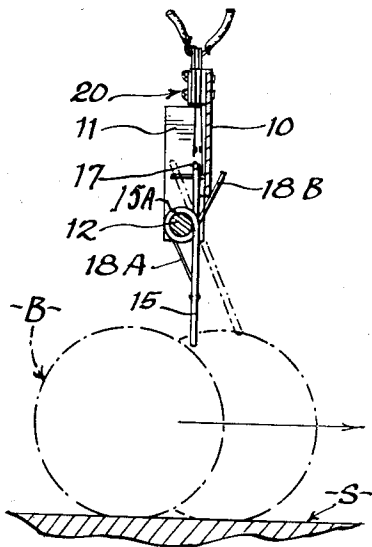


FIG. 2

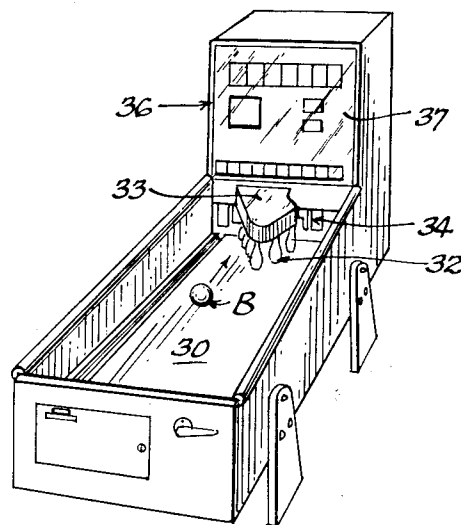


FIG. 3

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SELECTIVELY OPERABLE BALL GATE AND SWITCH MEANS

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The present disclosures pertain to ball-operated switching and gating devices for use in ball-rolling amusement apparatus such as coin-controlled bowling games and the like, the described improvements having as their principal object the provision of a selectively operable ball gate and switch means including a plurality of independently movable ball-gate members mounted as a set serially across a ball-playing alley in such manner and form that a played ball may strike and actuate certain gates alone, or certain other gates in combinations, depending on the line of approach of the ball and other factors such as the shape and size of the individual gating members.

It is a further object to provide multiple gate switches as a part of the unit and arranged in groups of a certain number in relation to the gates so that the switches of each group will be jointly actuated by the corresponding gate means in ball-gating operation.

A further object is the provision of a ball-actuated control means in the form of a unitary combination of a plurality of separately movable ball gates arranged in a line transversely across a ball-rolling field so that at least one gate member must be struck and actuated by an advancing ball; and further to provide a simple and rugged type of switch means cooperable in group arrangements with the gates and of a type easily accessible for wiring and adjustment, such switch means being adapted for connection in score control circuits in conjunction with other ball-actuated game instrumentalities or targets also intended to be struck by the played balls in movement toward the gate unit.

Other aspects of novelty and utility characterizing the invention relate to details of the construction and operation of the illustrative embodiment described hereinafter in view of the annexed drawing, in which:

Fig. 1 is a front elevational view of the novel ball gate switch means;

Fig. 2 is a vertical sectional detail looking along lines 2—2 of Fig. 1;

Fig. 3 is a perspective view of a simulated bowling game illustrating one application of the ball gate switch means.

As depicted in Fig. 1, the ball gate switch unit comprises an elongated base plate 10 having a pair of angle brackets 11 spot welded to opposite end portions thereof to support a long bearing rod 12 in spaced parallel relation to the lower longitudinal edge of said plate.

Serially spaced along the bearing rod are a number of individual ball-engaged pendant members, sometimes also referred to as "ball gates," there being seven such gates in the illustrative embodiment and designated by Roman numerals I to VII, each gate being preferably formed from heavy wire rod stock into an approximately U-shape in that each gate has a pair of side arms 14 and 15 joined by an intervening portion or bight 16.

The several gate members are rockably mounted on rod 12 by means of integral bearing loops 14A and 15A formed at the ends of the side arms or legs 14 and 15,

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said loops 15A respectively terminating the appertaining arms 15, whereas the several other arms 14 are further extended and formed beyond their respective bearing loops 14A to provide laterally offset combination switch-operating and stop arms 17 each extending approximately parallel to the axis of bearing rod 12.

Mounted along the length of plate 10 are a plurality of leaf-spring or stack switches 20 each having at least one contact member 21 situated behind the stop arm 17 of a corresponding ball gate member to be engaged and moved thereby to actuate the corresponding switch.

For purposes of controlling the scoring action of balls B rolling on a playing surface S located below the gates according to some desired scoring plan, as in a simulated bowling game, which utilizes a control unit such as described in view of Fig. 1 herein, there may be a different number of switches 20 associated with each gate.

In the device of Fig. 1, gates I, III, V, and VII each have only one switch 20 controlled thereby (although any said switch may have a plurality of contacts actuated or controlled by the appertaining gate arm 17), it being observed that gates II and VI have three switches 20 associated therewith, while gate IV has four such switches.

Each gate member is yieldingly urged into a normal, pendant position by a torsion spring 18 carried on rod 12 with one end 18A hooked onto the gate and an opposite end 18B bearing under tension against the plate 10, whereby the gates are not only maintained in erect operating position for engagement by a ball, but the appertaining switches or stop arms 17 are severally pressed against the correspondingly associated switch blades or contacts 21 to open (or close if desired) the associated switches.

An important feature of the gate structures resides in the fact that they are shaped for selective group actuation, for instance, it will be observed that the bight portion 16 of gate II is longer than the bight of any other gate, and in fact is somewhat longer than the diameter of the ball B as a reference standard, by reason of which it will appear that if the course of ball B were to be directed squarely at the middle of the bight 16 of gate II, that gate, and no other, would be operated, that is, swung open as in the dotted line representation of the gate shown in Fig. 2.

It will further be observed that the endmost gates I and VII have much shorter bights 16 than gate II, and these endmost gates moreover are vertically or pendantly longer or closer to the surface S than the remaining gates, for instance gates II or VI, said endwise gates being intended to guard the two outside lanes or "gutters" so that any ball passing out of play at these locations or even close enough thereto to partly engage an adjoining gate portion such as 14—16 of gate II together with portions 15—16 of gate I (see ball B²) would positively swing the gutter gate I (or VII). A similar action can occur between gates VI and VII, as illustrated by ball B⁴.

Further examples of the foregoing selective and group operation of the gates by the balls are illustrated by the ball B which can actuate gate III alone, or gates II and III together or III and V together. Ball B³ could actuate gate V alone or in combination with gate VI; and ball B⁴ could actuate gate VI alone or in combination with gate VII.

In general, the balls B are made of a somewhat hard-rubber-like composition and may weigh as much as three pounds; and they will have a predetermined diameter, for instance about 3½ inches, in relation to the shape and size and axial spacing of the set of gates so as to engage the same in a desired selective or grouping manner along the lines of the illustrative examples given, the gate assembly or unit being mounted above the ball-rolling alley or surface S at a level such that the ball B cannot

pass there beneath without operatively opening or swinging at least one gate, with consequent actuation of the appertaining control instrumentality or switch means 20.

One successful application of the novel ball gate score control means to a bowling game is illustrated in Fig. 3, depicting a cabinet having a miniaturized bowling alley 30, above which is mounted a set of ten simulated bowling pins 32 pivotally suspended beneath a hood 33 housing mechanism (not seen) for automatically elevating the pins out of play when struck by a ball B.

Behind the set of pins 32 is mounted a ball gate control unit 34 of the type described in view of Figs. 1 and 2, in a position such that some gate will be struck by any ball passing the array of pins.

In a game of the type described, realistic pin action and scoring may be achieved by utilizing the novel gate means, and more particularly by connecting the several gate switches 20 in a score-control circuit (not shown) setting up score values in an award or score-registering or displaying mechanism (not shown) such as is commonly included in the cabinet portion 36 in conjunction with a score display light-up panel 37, so that the ball B, after striking various combinations of pins 32 by reason of the original direction of travel thereof, will thereafter strike one or more of the ball gates I to VII and thereby set up corresponding scoring circuits dependently upon which of the pins 32 may have been hit.

The circuit connections and apparatus for such a score-control arrangement are not further described herein, since they relate to a separate invention.

I claim:

1. A ball gate mechanism for use in ball-rolling games and comprising: a long mounting plate; a long pivot rod supported by said plate in parallelism to the plane thereof; a plurality of ball gates each formed by heavy wire stock turned back upon itself to include a bight portion flanked by a pair of side arms, at least one of which, on at least one said gate, is extended to form a switch-actuating arm, opposite portions of the side arms of each gate being looped to form aligned pivot portions freely engageable on said pivot rod with said gates mounted in a series close together thereon; spring means yieldingly urging each of the gates with the bight portions thereof pendant in a common normal plane for ball operation; and switch means carried on said plate in operative juxtaposition relative to said switch-actuating-arm extension for operation thereby responsive to movement of the appertaining gate a predetermined amount from said normal plane.

2. Mechanism according to claim 1 further characterized in that the side arms of certain gates are of a different length, measured from said axis rod, from each other, whereby to render the bight portions thereof narrower

in a direction paralleling the axis of said rod so as to render such gates inoperable by a ball of certain diameter rolling therebeneath in a certain position.

3. Mechanism according to claim 1 in which said bight portions of certain gates are of different length than those of other gates measured in the direction of length of the axis rod in order to render the same unengageable by a ball of certain diameter passing therebeneath in certain positions.

4. Mechanism according to claim 1 in which one of the side arms of at least one gate is offset so that the appertaining bight portion is shorter in length in the lengthwise direction of said axis rod than the distance between the appertaining pivot portions, whereby to form a narrowed ball-engaged bight on the gate, rendering the latter immune to operation by a ball of certain diameter passing therebelow along a certain line.

5. In a switch gate structure to be actuated by a ball of predetermined diameter rolled along a surface therebelow, improvements comprising: a long support adapted to be mounted above a ball-rolling surface as aforesaid; a long pivot rod carried by said support to extend crosswise above said surface in parallelism therewith; a plurality of gate members each consisting of a stiff wire turned into loop form to have a bight portion flanked at opposite ends by an arm and each arm having a pivot formation therein for engagement with said rod, at least some of said gates having one of the arms extended beyond the appertaining pivot formation and offset to provide an elongated switch-operating extension; said gates being pivotally supported by their respective pivot portions in a series along said rod with the bight portions thereof normally parallel to said surface; switch means carried by said support in positions for actuation by the operating extension of some of said gates; some of said gates having side arms of different length than other gates whereby the bight portions thereof lie at different distances from said surface; some of said gates having a side-arm portion bent to shorten the bight portion thereof axially of said rod; and spring means acting on each gate to dispose the same normally as aforesaid.

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