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L. A. DURANT

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MAGNETIC ELECTRIC SWITCH FOR GAMES

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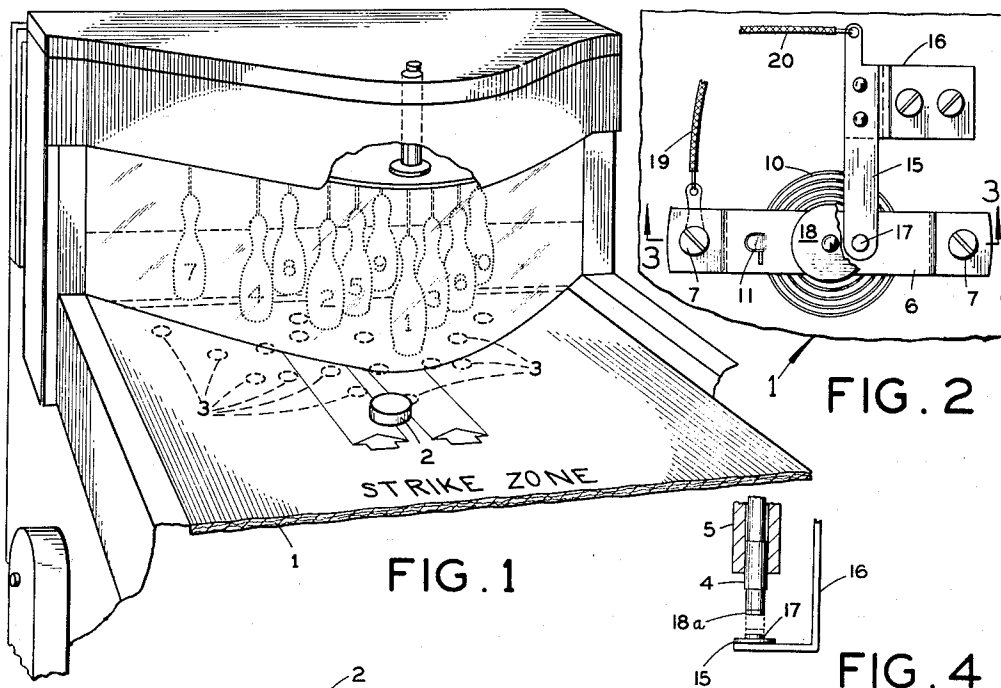


FIG. 1

FIG. 2

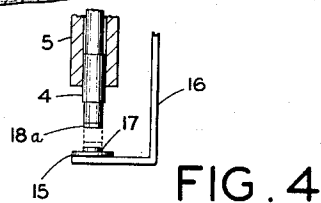


FIG. 4

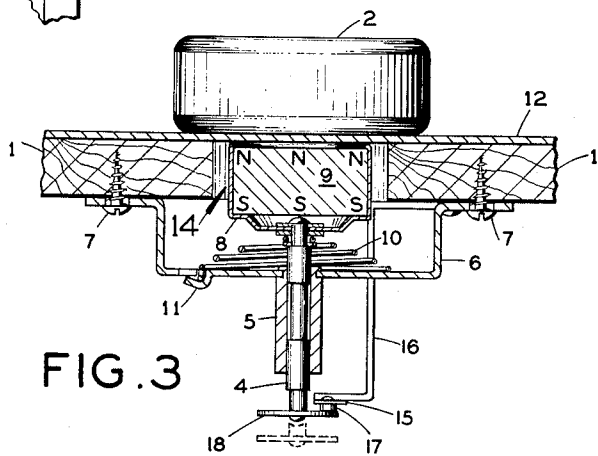


FIG. 3

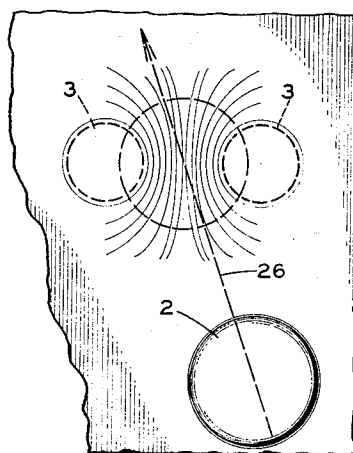


FIG. 5

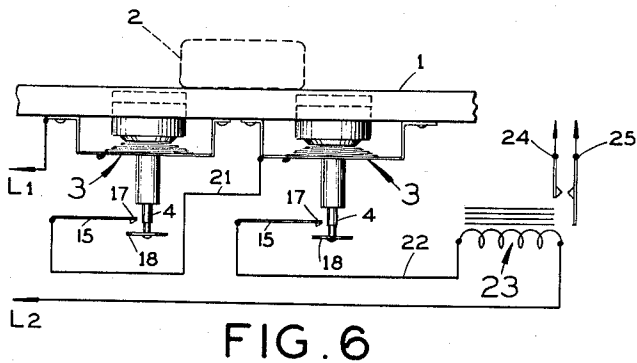


FIG. 6

INVENTOR.
LYNDON A. DURANT
BY
Lloyd J. Durant

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MAGNETIC ELECTRIC SWITCH FOR GAMES

Lyndon A. Durant, Chicago, Ill., assignor to United Manufacturing Company, Chicago, Ill., a corporation of Illinois

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4 Claims. (Cl. 200—61.1)

This invention relates in general to games of skill and more particularly to electric switches associated with targets on a board forming a playing field of shuffle board or bowling type games.

Prior to this invention pluralities of electric switches associated with certain targets were mounted on the under side of the playing board and having the actuators therefor extending upward through apertures in the board positioned in the path of the puck or ball for direct impact thereby when manually propelled along the upper surface of the board. Certain of the actuators are usually arranged in a manner requiring accurate direction of the puck or ball for operation and the corresponding scoring of each play whereas other actuators are positioned in a manner requiring lesser accuracy for scoring points of lesser value for each play.

Reference is made to applicant's United States Patent No. 2,572,456, which describes one form of a prior impact responsive switch for the above purpose.

Impact switches in general are fraught with many objections and disadvantages such as lack of sensitivity to differentiate between narrow margins of direction of the puck or ball and improper operation resulting from shock and vibration imparted to the playing board during the play. Actual physical damage to the switches or their actuators from normal play or abuse is commonplace.

Other failures occur as a result of debris or wax particles on the playing board descending through the apertures and contaminating the electric contacts of the switches which results in inaccuracies and failures in associated automatic scoring systems.

The present invention overcomes these and other disadvantages and objections by the provision of a sensitive magnetic electric switch secured to the under side of the playing board and adapted for operation by a paramagnetic ball or puck traveling on the upper surface of the board without the necessity for apertures extending therethrough, and is a principal object of the invention.

A further object of the invention is the provision of a magnetic electric switch secured to the under side of a playing board responsive to a paramagnetic puck or ball traveling on the surface of the board in a path in predetermined proximity with said switch.

Another object of the invention is the provision of a magnetic electric switch highly resistant to shock forces secured to the under side of a playing board including a magnetic plunger adapted to move normal thereto for operating electric contacts when the plunger is attracted by a paramagnetic body moving on the upper surface of said board in a path in predetermined relation to the axis of the said plunger.

Another object of the invention is the provision of a magnetic switch for scoring in a game secured to the under side of the playing board thereof and a paramagnetic puck adapted for frictional sliding travel on the upper surface of the board with the magnetic properties of the switch and the puck adjusted to operate at any relative velocity below a predetermined maximum ve-

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locity for limiting the scoring above said maximum velocity to discourage physical abuse to the game by a player imparting excessive velocity to the puck.

Another object of the invention is the provision of a pair of series connected magnetic switches secured to the under side of a playing board including an electric circuit to a scoring device requiring the simultaneous operation of both said switches to energize the scoring device when a paramagnetic body is moved in a precise predetermined linear path along the upper surface of the board between the location of said switches.

These and other objects and advantages in one embodiment of the invention are shown and described in the appended specification and drawing, in which:

Fig. 1 is a perspective fragmentary illustration of a typical game for illustrating the invention.

Fig. 2 is a bottom plan view of one of the magnetic electric switches in the game shown Fig. 1.

Fig. 3 is an enlarged cross sectional side elevation taken through section line 3—3, Fig. 2.

Fig. 4 is a fragmentary view of an alternate construction of the contact portion of the switch shown Fig. 3.

Fig. 5 is a fragmentary diagrammatic view illustrating a predetermined path of travel of a puck between the location of two switches in the game shown Fig. 1.

Fig. 6 is a diagram illustrating an electric circuit connecting a pair of the switches shown Fig. 3 to a scoring device.

Fig. 1 illustrates a typical shuffle-bowling type game in which a planar playing board 1 forms a principal part thereof. In this illustration a plurality of simulated bowling pins are positioned at the end of the playing board as targets for the player when sliding a puck 2 along the board for scoring.

A plurality of electric proximity switches 3 are strategically secured in predetermined relation under the board 1 and connected by electric circuits to an automatic scoring device, not shown.

Referring to Figs. 2 and 3, each switch 3 consists of a plunger 4 retained for reciprocation normal to board 1 in a relatively long guide bushing 5 retained by a U-shaped bracket 6 secured to the bottom surface of the board 1 by screws 7—7. A cylindrical cup 8 is coaxially secured, by riveting, to the upper end of plunger 4 as shown. A cylindrical permanent magnet 9 is secured in cup 8 by the inward swaged upper edge of the cup as shown.

The magnet is preferably of the ceramic type of relatively low density and uniformly poled at opposite upper and lower ends thereof as shown. A spiral pig-tail 10 is secured by its upper end to plunger 4, by swaging, as shown and the outer end thereof secured in an integral offset lug 11 in bracket 6. The pig-tail 10 provides a low resistance electric path between the bracket 6 and the plunger 4 and its tension adjusted to minimize any force acting in either direction on the plunger 4.

In this embodiment, the board 1 is a dielectric, preferably of plywood, to which is laminated by adhesive a wear resistant plastic sheet 12 and for convenience of manufacture a cylindrical clearance bore 14 for the cup 8 of each switch 3 is made through board 1 before the sheet 12 is applied, thus providing uniform distance between the upper end of the magnet 9 and the top surface of the playing board equal to the thickness of sheet 12.

A switch blade 15 is riveted to bracket 16 secured to the under side of the board as shown and is provided with a contact 17 in the outer end thereof positioned for contact with a mating disc contact 18 in the lower end of plunger 4 when the plunger is moved against the action of gravity to its activated upper position.

When a paramagnetic puck 2 is positioned substantially coaxial with the magnet 9, the magnet and plunger

4 will move to the position shown Fig. 3 closing contacts 17 and 18 with a desirable wiping action by virtue of the flex of blade 15.

When the puck 2 has moved a predetermined distance from the axis of magnet 9, the magnet and plunger will gravitate downward to its rest or open circuit position, shown in dotted lines. Conductors 19 and 20, shown Fig. 2, are intended to be connected in an electric circuit to a scoring device, not shown.

It is to be understood that conventional scoring devices operate on either normally open or normally closed circuits, and for operation with the latter, Fig. 4 illustrates an alternate contact construction wherein a contact 18a is coaxially secured in the end of plunger 4 and the blade 15 relocated to permit the closing of the contacts 17 and 18a when the plunger is in its lower rest position.

It is also to be noted that the relatively large movement between the contacts provided by the plunger 4 prohibits unwanted closure of the contacts by shock or vibration imparted to the playing board.

In operation and in normal inactive position, all the magnets 9 and their plungers 4 are in their lower positions and when a paramagnetic puck 2 traveling in a path over the surface of the board comes within predetermined proximity of the axes of any of the magnets 9, the magnets and plunger 4 affected will momentarily rise and energize or de-energize the scoring device, depending upon the aforesaid type of circuits employed.

It is apparent that a magnet similar to magnet 9 and oppositely poled can be inserted in puck 2 to augment the attraction of magnet 9 for more forceful operation. Similarly, the magnet 9 in the cup 8 can be replaced by a paramagnetic metal cylinder for cooperation with a magnet in the puck with comparable resulting function.

Referring to Fig. 6, a pair of magnetic switches 3 in predetermined spaced relation on board 1 are series connected by conductors 21 and 22 to a source of power L1—L2 and a relay 23 for operating scoring contacts 24—25 for connection to a scoring device not shown.

With this arrangement the opposing fields of magnets 9, illustrated by fine line in Fig. 5, provide for different predetermined scoring paths 26 of precise narrow limits in a predetermined direction on the playing board 1 whereby a paramagnetic puck or other magnetic body must be propelled accurately between the switch to simultaneously operate the same to complete a circuit to relay 23 and close scoring contacts 24 and 25. It is to be noted that when a normally closed scoring circuit is used the same dual operation of a pair of switches will result when the alternate construction for normally closed contacts shown Fig. 4 are used and connected in parallel for normally holding the relay 23 energized.

It is now apparent that a plurality of switches 3 may be connected in unitary, parallel or series circuits to a scoring device to provide a wide variety of predetermined scoring conditions in a game of this character.

It is also apparent that the magnetic attraction between any given switch 3 and paramagnetic or magnetic body can be made sufficiently strong to stop and retain the body moving in a path at low velocity as an impediment to an opposing player or for scoring under predetermined rules of a particular game.

It is to be understood that certain modifications in the above construction retaining the features described are intended to come within the scope of the appended claims.

Having described my invention, I claim:

1. A proximity switch for games for operating an electric scoring circuit means comprising a board with a planar playing surface on the upper side thereof adapted to support movable magnetic playing bodies, a recess in the under side of said board forming a partition adjacent to and parallel with said playing surface, a bracket member secured to the under side of said board with a portion thereof extending over said recess, a plunger of conducting material slideably retained in said portion

for reciprocation normal to said partition for movement from a rest to an upper activated position, a permanent magnet means secured to the upper end of said plunger for movement in said recess for raising said plunger from said rest to said activated position when attracted in an upward direction, a first electric contact secured to the lower end of said plunger for movement in a vertical path, a second contact means on the under side of said board positioned in the said path of movement of said first contact for closed circuit engagement therewith when said plunger is in said rest position, independent conductor means connecting said plunger and said second contact means in said circuit means for normally completing an electric circuit therethrough whereby said plunger will move from said rest to said activated position and disengage said first contact from said contact means by the mutual attraction between said magnet and one of said bodies on said board when the latter is moved into predetermined proximity with said magnet.

2. A proximity switching means in a game of the character described comprising a planar board for supporting magnetic bodies propelled on the upper surface thereof, a pair of magnetic electric switches secured to the under side of said board in predetermined spaced relation, each said switch having a supporting member secured to the underside of said board and a magnetic actuator retained by said member for predetermined movement toward and from the said surface of said board, each switch including a pair of normally open electric contact means associated with said actuator and positioned to be closed by said actuator when the latter is moved toward said surface, a relay means for operating a scoring means when momentarily energized, a source of electric power, a circuit means connecting said contacts of each said switches in series with said relay means and to said source of power whereby one of said bodies propelled on said surface in a predetermined path above and between said switches will attract both said actuators substantially simultaneously and momentarily close said contacts in both said switches and momentarily energize said relay.

3. A proximity switching means in a game of the character described comprising a planar board for supporting magnetic bodies propelled on the upper surface thereof, a pair of magnetic electric switches secured to the under side of said board in predetermined spaced relation, each said switch having a supporting member secured to the underside of said board and a magnetic actuator retained by said member for predetermined movement toward and from the said surface of said board, each said switch including a pair of normally closed electric contact means associated with said actuator and positioned to be opened by said actuator when the latter is moved toward said surface, a normally energized relay means for operating a scoring means when momentarily de-energized, a source of electric power, a circuit means connecting said contacts of each said switch in parallel with said relay means and to said source of power whereby one of said bodies propelled on said surface in a predetermined path above and between said switches will attract both said actuators substantially simultaneously and momentarily open said contacts in both said switches and momentarily de-energize said relay.

4. A normally closed magnetic switch adapted to be secured to the underside of the playing board of a game comprising a means forming a frame, a plunger of conducting material journaled in said frame for vertical reciprocation normal to said board from a rest position to an upper activated position, a diamagnetic cup secured by the bottom thereof to the upper end of said plunger in coaxial relation therewith, a cylindrical permanent magnet secured in said cup with the axis thereof coaxial with said plunger and with the opposite ends thereof

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having opposite magnetic polarity, a first electric contact conductively secured to the lower end of said plunger, a first electric junction, a flexible conductor means connecting said plunger and said first junction, a second electric contact positioned for engagement with said first contact when said plunger is in said rest position, a second electric junction including a conductor of predetermined resilience for retaining said second contact whereby said contacts will open and the electric continuity between said junctions will be broken when said 10

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plunger is moved from said rest to said activated position by said magnet when the latter is attracted by a magnetic body on said board above said switch.

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