

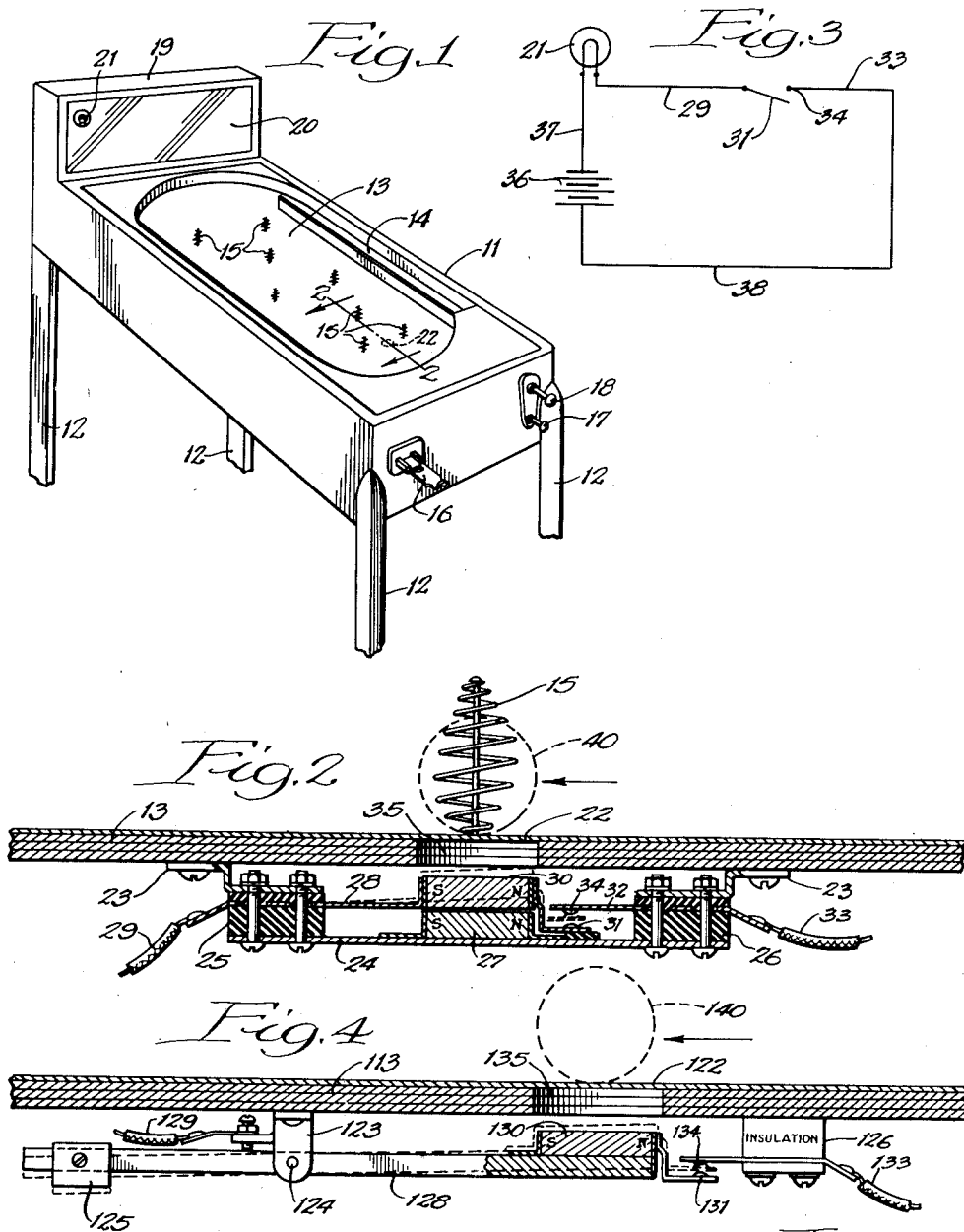
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SWITCH FOR PIN TABLES

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SWITCH FOR PIN TABLES

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This invention relates to switches for use in amusement devices familiarly known as pin tables. The object of the invention is to provide a switch which may be mounted entirely beneath the surface of the table, and which is actuated entirely by magnetic forces operating through the table top.

Pin tables usually embody an inclined table or board mounted in an enclosed cabinet. Within the cabinet are coin-controlled devices to unlock the table when the amusement device is to be operated, and suitable levers to elevate a ball from an inactive position within the cabinet and beneath the table into a position from which it may be projected upon the inclined board or table surface in an attempt to direct it into or against targets upon the table.

Early forms of pin tables had targets cut into them in the form of holes in the table surface. A ball which was skillfully directed to the target would fall through the hole into an inactive position beneath the board. Only the operator's observation of the ball passing through the hole and his normal recording of the fact would enable him to keep a record of his success and skill. Later, suitable switches beneath the board were employed with electrical currents and indicators upon the cabinet to indicate that the ball had passed through the hole and had been successfully directed to the target. These switches were frequently connected in circuits with electric registers or lights or other visual indicating devices to announce the fact that the ball had reached the target.

Other forms of pin table have come into common use in which the ball strikes actual contact switches protruding above the inclined table surface. These switches are closed when struck by the ball and thus give an electrical indication by suitable indicators of the fact that the ball has been successfully directed against the target.

It is the object of this invention to provide a switch which can be mounted beneath the inclined table surface without any portion thereof projecting above the table surface, but which can nevertheless be operated by the passage of a ball over a predetermined area above the switch, thus to close circuits for the operation of suitable scoring or registering mechanisms.

A further object of the invention is to provide a switch which is invisible and may be located beneath the board in a position not indicated upon the surface of the board, but which will nevertheless be operated by the passage of a ball over a predetermined area of the board and thus give

an indication that the target has been reached without disclosing to the operator where the target is located. This introduces an element of mystery and surprise into the game.

It is a further object to provide a sensitive magnetic switch utilizing opposing magnetic fields to effect sensitive operation of a movable switch element when a magnetically attractable object passes into said field or fields;

Other objects, advantages and capabilities of the invention will appear from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a view in perspective of a pin table equipped with this invention;

Fig. 2 is a sectional side view of a fragment of the inclined table taken on the line 2—2 looking in the direction of the arrows and showing in phantom a ball passing over the switch;

Fig. 3 is a schematic representation of a circuit in which the switch of this invention may be employed;

Fig. 4 is a fragmentary view of a section of the playing board, showing a modified form of the switch of this invention.

Referring to the drawing, the reference numeral 11 indicates the cabinet of a pin table. It is mounted upon the legs 12 and is equipped with the inclined table 13. At one side of the inclined playing field is the alley 14 out of which the balls are successively projected to the top of the inclined table, whence they run by gravity down the length of the table to the bottom thereof.

The table is equipped with a number of obstacles and hazards, such as the spiral springs 15, which interfere with the course of the ball down the board and give it erratic movements which tend to maintain the ball upon the board longer than if it were permitted to make a straight path from the top to the bottom of the board.

At the front of the cabinet is the coin-controlled lever 16 by which a coin may be employed to unlock the mechanism for operation, and also the elevator lever 17 by which a ball may be raised from an inactive position beneath the board into the alley 14 so that it may be projected to the top of the board by the plunger 18. The coin slot lever 16 and the elevator lever 17 are manually operated, and the plunger 18 is customarily retracted manually and forced forward by a coil spring. These form no part of the present invention.

At the back of the cabinet 11 is mounted a

small auxiliary cabinet 19, the front of which is covered with a pane of glass 20, through which suitable visual indicating means may be seen. In the preferred embodiment shown in Fig. 1 the visual indicating means disclosed is the electric light 21.

Indicated by the numeral 22 on the inclined board in Fig. 1 is the target which may consist of a marked area of the board or may be left without any indication of its location. While only one target is shown, it is customary to employ a plurality of them upon each table. These targets are usually located at positions between or surrounded by the hazards and obstacles 15 to make access thereto more difficult.

Beneath the target 22 is located the switch of this invention. In Fig. 2, where the switch is shown in section, it is shown secured to the under surface of the inclined board by means of the bracket 23. The switch is composed of a base 24, preferably of non-magnetic material. Secured to the base are the insulating blocks 25 and 26 and also the base magnet bar 27.

Mounted upon the insulating block 25 is the flexible contact strip 28, at one end of which is formed the lead 29 for the electrical circuit, and the other end of which is formed to provide a pocket for the movable magnet bar or field propagating means 30, beyond which the flexible strip 28 is extended to provide a mounting for the movable contact point 31. The flexible strip 28 is made of light spring metal and this provides a pivotal mounting for the movable magnet bar 30 and the contact point 31.

It is to be noted that the magnet bar 30 is mounted directly over the magnet bar 27 with the corresponding poles, indicated by the letters "S" and "N," which indicate respectively the south and north poles of the respective magnet bars, aligned. Thus mounted the magnet bars repel each other because the respective magnetic fields thereof are in opposition.

The movable magnet bar 30 is mounted above the stationary magnet bar 27 with the poles aligned in order that the repulsion of the similar poles to each other will tend to force the movable magnet bar upwardly and suspend it in the air above the stationary magnet bar 27. The magnetic field thus produced above the movable magnet bar 30 is such that the passage of an iron ball (or other paramagnetic object of suitable magnetic qualities to co-operate with the field propagating means 27—30) over or into the field of the movable magnet bar will swing it upwardly upon the flexible strip 28 and bring the movable contact point 31 into contact with the fixed contact point 34.

This stationary contact point 34 is mounted upon the contact strip 32, mounted upon the insulating block 26. One end 33 of the contact strip 32 forms the lead for the circuit and the other end supports the contact point 34, which directly overlies the contact point 31 affixed to the flexible contact strip 28.

It is to be noted that the movable magnet bar 30 is mounted directly beneath the inclined board 13 and preferably as near thereto as the range of movement of the magnet bar 30 will permit. Cutting away of the playing board 13, as indicated by the pocket 35 beneath the target 22, permits the magnet bar 30 to move into the pocket and thus permits the magnet bar to be located nearer to the upper surface of the inclined board than would otherwise be possible.

In Fig. 3 is indicated in schematic representa-

tion a simple circuit in which the switch may be interposed. The circuit is composed of a source of electricity, such as conventional batteries 36 with one lead 37 running to the lamp 21 and the other lead 38 running to the switch indicated by the numerals 29, 31, 33 and 34. Obviously, any other indicating device, such as an electro-magnetic relay, a bell, or gong, or an electrically actuated register, may be substituted for the lamp 21. In the circuit shown, upon closing of the switch by bringing the contact points 31 and 34 into contact, the electrical energy from the battery 36 will light the lamp 21 and indicate that the switch has been closed. If other indicating means were substituted for the lamp 21, the closing of the switch would operate the signalling means and disclose to the operator that the switch had been closed.

In Fig. 4 is shown a modified form of the switch of this invention in which there is substituted for the stationary bar magnet 27 a counterpoise to make the switch sufficiently sensitive to be actuated by the passing of the ball over the target. In this figure is shown the inclined board 113, upon which the area indicated by the numeral 122 serves as the target. Beneath the board and pivotally secured thereto upon the bracket 123 is the rigid lever 128. This lever is pivoted intermediate its length at the pivot 124 so that the lever may rock within the bracket 123. The lever 128 is provided at one end with the adjustable counterpoise or counterweight 125 which may be moved along the length of the lever 128 with respect to the pivot 124 in order to balance the lever at the time of its installation and to provide for differences in the weight of the other end of the lever customarily encountered in normal manufacturing operations. The other end of the lever 128 is provided with a pocket within which is mounted the movable bar magnet 130, beyond which the lever is extended to form a mounting for the movable switch contact 131. It is to be noted that the bar magnet 130 is mounted directly beneath the target 122, and in order to permit the bar magnet to be mounted nearer the upper surface of the playing board the playing board 113 may be cut away at the pocket 135 to bring the magnet nearer the upper surface of the board.

A suitable electrical lead 129 to run to the signalling device is indicated as secured to the bracket 123, which is also provided with an adjusting screw, by which the horizontal position of the lever 128 can be adjusted, both to insure the separation of the movable contact point 131 from the stationary contact point 134 and to bring the movable bar magnet 130 as near as possible to the upper surface of the inclined playing board 113.

The stationary contact member 134 is mounted upon the insulating block 126, secured to the under surface of the playing board 113, and is provided with the lead 133 which runs from the switch to the battery or other source of electrical energy.

Operation of the switch

In operating the playing board a ball 40, made of iron or other metal capable of being attracted by a magnet, is employed. The ball is brought from its inactive position within the cabinet into the alley 14 of the inclined board by means of the elevator lever 17. Thereupon the plunger 18 may be retracted, and when released will propel

the ball 40 upon the board 13 near the top thereof.

Thereupon the ball will move by gravity toward the lower end of the playing board and in its course over the board will encounter various hazards and obstacles 15 and be diverted into an erratic course. When the ball passes over the target 22 above a switch of the type illustrated in Fig. 2, it enters the magnetic field above the movable magnet 30 and causes the magnet bar 30, which is being repulsed by the stationary magnet 27, to be attracted toward the ball. The movement of the magnet bar 30 is indicated by dotted lines in Fig. 2. When the magnet bar 30 rises, the switch contact 31 mounted upon the end of the flexible strip 28 is brought into contact with the stationary contact point 34 and the circuit is closed so as to light the lamp 21 or to operate any other signalling means or device that may be employed in the circuit.

If the switch employed is of the type illustrated in Fig. 4, the passage of the ball 140 over the target 122 will similarly attract the movable magnet 130, which will swing the lever 128 about its pivot 124 and cause the movable contact point 131 to come into contact with the stationary contact point 134 and thus close the circuit and operate the signalling means connected therein.

It will be apparent that the improved magnetic switch device disclosed herein may be utilized in other environment, than those of an amusement game, and that in addition the switch may be arranged for actuation by any magnetically attractable object, other than a ball, suitable for the purpose.

Those skilled in the art will recognize that operating conditions will vary, particularly with reference to the proximity with which the entire switch structure may be mounted to the board 13 or other mounting member; and also with the size and magnetic qualities of the paramagnetic member or ball 40; and also the size and magnetic qualities of the field propagating means, magnets 27—30. In general it may be observed that the proportions shown in the drawing give satisfactory results, the ball 40 being the usual steel ball customarily employed in the amusement game industry for use with bagatelle or pin ball games, and the magnets 27—30 being preferably, though not necessarily of the strong and relatively long-lived quality of magnetic material known commercially as Alnico or analogous materials. It will also be understood that the operating principles employed in the novel switch structure may be effectuated by the use of other known means for propagating magnetic fields, instead of the permanent magnets 27—30—for example in some installations it might be desirable to substitute electro-magnets or the like for members 27—30.

It will be recognized therefore that while the invention has been disclosed in connection with certain specific details of a preferred embodiment thereof which has given satisfactory operating results, such details are not intended to be limitative of the invention except as may be provided in the annexed claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A switch of the character described, comprising a movable magnet, a stationary magnet supported beneath said movable magnet with the poles of the magnet aligned so that the mag-

nets repel each other, and a circuit breaker actuated by the movement of the movable magnet.

2. In a switch of the class adapted to be actuated by passage in proximity thereto of a paramagnetic object, the combination comprising: a movable switching member and means normally urging the same into a first operating position; and means operatively associated with said member for propagating opposing magnetic forces tending, but normally insufficient, to overcome the effect of said first-mentioned urging means, but being effective to overcome the effort of said first-mentioned urging means to cause said switching member to move into a second operating position upon passage of an object of predetermined paramagnetic qualities into the field of at least one of said propagating means.

3. In a pin table provided with an electrical circuit, a switch in said circuit comprising a movable magnet, a second magnet stationarily mounted beneath said movable magnet and with the poles of the movable magnet overlying corresponding poles of the stationary magnet and their respective fields intercepting each other, a movable contact point carried by said movable magnet, a complementary contact point mounted in the path of said movable contact point, and leads from said contacts to said circuit.

4. In a pin table provided with an electrical circuit, a switch in said circuit mounted beneath said table and designed to be actuated by passage of a metal ball over a predetermined target area on said table, said switch comprising a flexible strip secured at one end to the underside of the table, a movable magnet mounted on said strip and near the free end thereof, a contact point mounted on said strip near the free end thereof, a stationary magnet mounted beneath said movable magnet with their respective poles aligned so as to repel each other, and a complementary contact point mounted in the path of movement of said first contact point.

5. In a pin table provided with an electrical circuit, a switch in said circuit mounted beneath said table and designed to be actuated by the passage of a metal ball over a predetermined target area on said table, said switch comprising a flexible elongated strip mounted at one end and beneath said table and extending along the undersurface of the table and spaced therefrom, the other end of said strip being movable towards and away from the undersurface of said table, a magnet mounted on said strip near the movable end thereof, a contact point mounted on said strip near the movable end thereof, a stationary magnet mounted beneath said movable magnet with the poles of the magnets aligned so that the magnets repel each other, and a complementary contact point mounted in the path of movement of said first contact point.

6. In a magnetic switch of the class adapted to be actuated by the passage in close proximity thereto of a magnetically attractable object, the combination of a movable operating element for said switch, means relatively stationary with respect to said operating element for propagating a magnetic field, means movable with said operating element for propagating a magnetic field of polarity such as to move said operating element in a direction away from said first mentioned field and into a predetermined normal position, said second mentioned propagating means being further arranged to propagate said field thereof relative to said moving object whereby the latter upon entering said last mentioned field

will cause said operating element to be moved from said normal position into an operated position.

7. A circuit breaker comprising in combination, a movable element and contact means co-operable therewith to open and close circuit connections dependent upon movement of said movable element, means for propagating a magnetic field adjacent said movable element, means operatively associated with said movable element for opposing said first mentioned field in a manner to urge said movable element in a direction

away from said first mentioned propagating means to dispose said contact means in a predetermined normal condition, and means for mounting said circuit breaker with respect to the path of movement of a magnetically attractable object such that the latter may pass with respect to the field propagated as aforesaid whereby to further such movement of said movable element in a direction away from said propagating means to dispose said contact means in other than said predetermined condition.

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