June 17, 1952 G. R. BENAK 2,600,832

DUAL ACTION BALL SWITCH

Filed Oct. 16, 1947

FIG. 1.

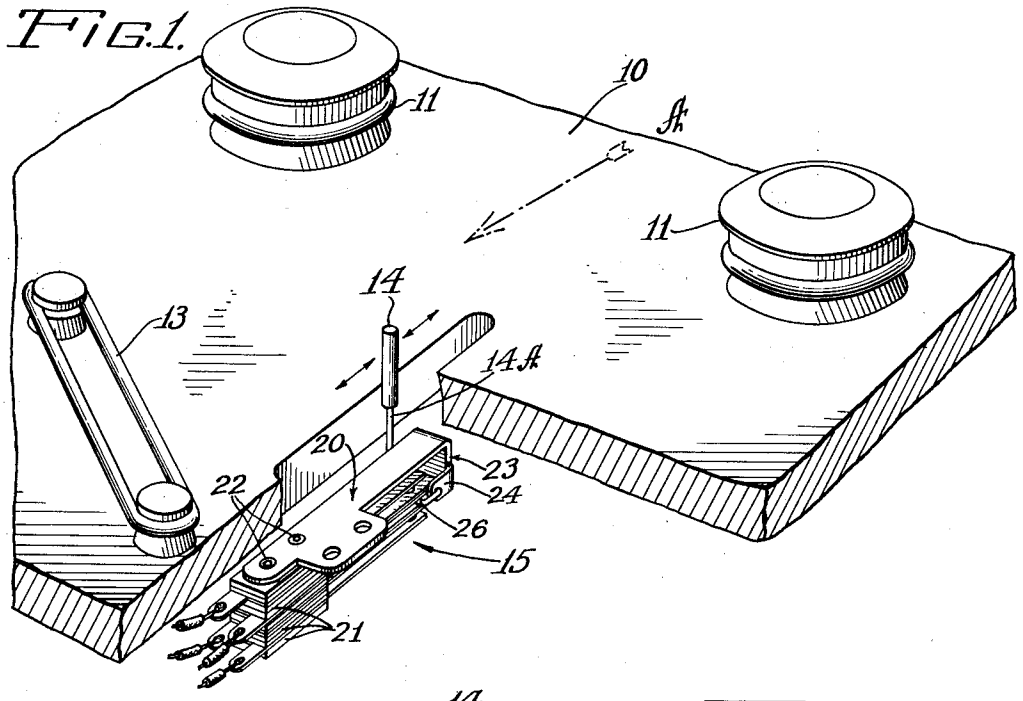


FIG. 2.

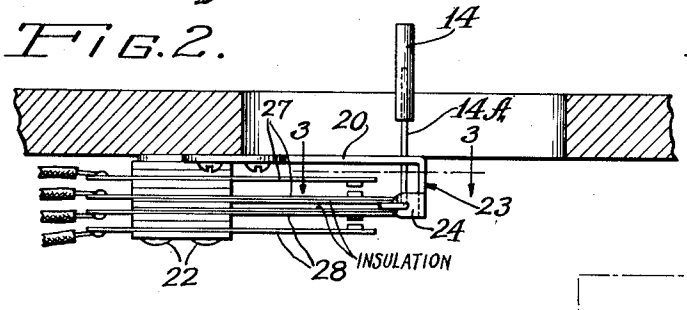


FIG. 3.

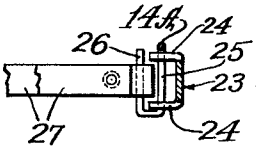
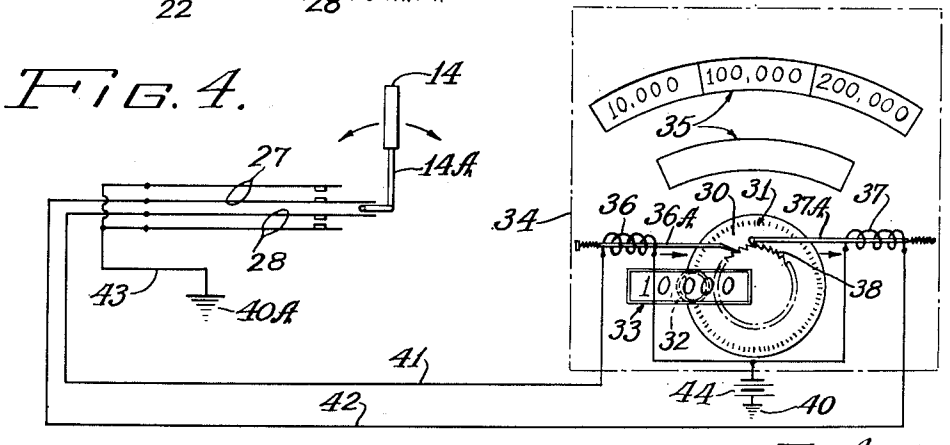


FIG. 4.



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DUAL ACTION BALL SWITCH

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4 Claims. (Cl. 200—1)

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This invention pertains to electric switches, particularly those adapted to use in ball rolling games and the like.

A principal object of the invention is the provision of a dual action roll-over switch for use in ball rolling games and acting to close a circuit when engaged in either of two directions, the circuits closed in either case being different so that two distinct scoring circuits may be set up.

Another object is the provision of a dual action switch of very simple construction and having an operating finger serving to close a different set of contacts when the finger is urged in opposite directions.

A further object is the provision of a switch for ball games so contrived that it may be operated by a ball passing in one direction relative thereto to close a first scoring circuit, and it may be operated by a ball passing in the opposite direction to close a different scoring circuit.

Additional objects and aspects of novelty and utility reside in details of the structure and function of the illustrative embodiment described hereinafter in view of the annexed drawing in which:

Fig. 1 is a fragmentary perspective of the play field of a ball rolling game showing the novel switch;

Fig. 2 is a vertical section through said play field showing the switch in elevation;

Fig. 3 is a fragmentary section through the switch along lines 3—3 of Fig. 2;

Fig. 4 is a circuit diagram illustrative of one use of the switch as a scoring control.

Fig. 1 shows part of a ball playing board 10 on which are mounted ball objectives or targets such as the bumpers 11 and resilient rebound band 13, and the operating lever 14 of a roll-over switch 15.

Switches 15, operable by movement of a lever like 14 in only one direction, are well-known in the art as roll-over switches; they are generally mounted beneath the ball board or panel 10 and may be used in numbers in any one game.

The general direction of travel of a ball on board or field 10 is in the direction of the arrow A, although the ball may meander widely over the board depending on its initial velocity and how many targets, bumpers, or the like it strikes on the way.

In prior arrangements, a ball advancing in the direction of the arrow A and striking the switch lever 14, if the old style roll-over switch were used, would make a circuit for scoring purposes; but if that ball, or any ball, should rebound, say from the bumper band 13 and strike lever 14 in the direction opposite from the arrow A, then such old style switch would not operate to close any circuit.

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Referring to Fig. 2, the novel, dual action roll-over switch is shown to comprise a metal bracket 20 on which is mounted a pile of insulating wafers 21, as by screws 22 passing through insulating sleeves (not seen) and the wafers and threading into said bracket. Metal contact springs are disposed in insulated relation from each other between said wafers, generally speaking, and this much of the structure, that is to say, the bracket, the wafers, and leaf-spring contacts, is old in the art.

Of importance to the invention is the provision of an offset 23 on bracket 20 at an end thereof with opposite lugs 24 pierced to receive the pivoting section 25 (Fig. 3) of the wire operating lever 14A; this section 25, after passing through the lugs, recurves in U-fashion to provide a contact-operating or engaging portion 26 extending substantially in parallelism with section 25, as in Fig. 3.

Of further importance to the invention is the arrangement of elongated, leaf-spring, contact fingers in pairs 27 and 28, at least, as shown in Figs. 2 and 4, so that one contact spring of each said pair lies on a side of portion 26 of the operating lever opposite from the other, or in other words, operating extension 26 of the switch lever is flanked by one adjacent contact spring of each said pair in a position such that opposite pivotal movement of the lever, producing a like movement of section or portion 26, will flex one or the other of said flanking contacts in one or another direction, depending upon the direction of movement of said lever, so that one or the other of the pairs 27, 28 of contacts will be closed.

The aforesaid closure of different sets or pairs of contacts, depending upon the direction of pivotal movement of the operating lever, may be utilized in a variety of scoring or light-up circuits in amusement and like apparatus; a schematic example is depicted in Fig. 4.

In Fig. 4, the dual switch is shown connected in a circuit to control an electromagnetic high-score unit of well-known structure in the art; as shown schematically for illustrative purposes, the score unit consists usually of a translucent disc 30 on which are score numerals 31 of certain opacity, and on one side of the disc is a projecting lens 32 in alignment with said numerals at one position. On the opposite side of the disc from lens 32 is a projecting lamp (not seen).

The score numerals are projected optically in enlarged scale on a viewing panel 33 in game cabinet 34, which usually also has other score

windows or light-up panels 35, all in a manner well-known in the art.

The particular high-score unit selected for illustration of this novel switch has at least two electromagnetic solenoids 36 and 37, each with its pawl means 36A or 37A arranged for different length of stroke in engagement with disc-turning ratchet teeth 38 to cause the disc to rotate in greater and lesser steps or amounts. Thus, energization of solenoid 36 might cause an advance of the score-numeral disc from a score of 10,000 to one of 20,000, while energization of the other solenoid 37 might cause an advance from 10,000 to 50,000.

Referring still to Fig. 4, one terminal of each of the solenoids 36 and 37 is connected to a return or ground 40, while the remaining terminal of solenoid 36 connects via conductor 41 to one of the contacts of pair 28, and the remaining terminal of solenoid 37 connects via conductor 42 to one of the contacts of the other pair 27, with the remaining contact of each of said pairs 27 and 28 connecting by conductor 43 to ground or return lead 40A, a power source or battery 44 being in series with ground return lead 40, such that closure of either pair of contacts 27 or 28 will energize one or the other of the scoring solenoids 36 or 37 with the different results heretofore noted.

Any other of a variety of electrical score control devices may be obviously substituted for the solenoids 36 and 37. For example, a high-score unit such as shown in U. S. Patent No. 2,410,708 to Breither et al., may be used.

Reverse-action switches are known in the arts, including those utilizing leaf-spring or jack-spring contacts, for example in connection with key or lever switches used in telephony; the present invention claimed for this disclosure pertains more particularly to the simplified construction including parts 23, 25, 26, and the arrangement of the latter with respect to oppositely flexing contact springs; and the combination of the dual action switch in a ball game for different scoring functions depending upon the direction of approach and engagement of the playing piece or ball.

Having thus described and explained in detail the construction and use of my invention, improvement, and discovery so as to distinguish it from other inventions, the parts, improvements, and combinations particularly claimed as my invention as required by R. S. 4888 are:

1. A ball switch for reverse action comprising a bracket, a pair of contact springs extending in substantial parallelism on said bracket, an offset on said bracket near one of the ends of said pair of contact springs, an operating lever projecting approximately at right angles to the planes of said contact springs and having a U-shaped end off-set at approximately right angles to itself with the opposite sections adjoining the bight of said U-shaped end lying in a plane approximately parallel with that of each of said contact springs and the adjoining said section nearest the lever pivoted in said bracket offset, and the remaining said adjoining section disposed between said contact springs such that each of the latter will be flexed in a direction opposite or away from the other responsive to rocking of said lever in opposite directions, and contact means cooperable with said pair of contact springs for connection in a control circuit.

2. A switch of the class described comprising an elongated operating lever having a U-shaped portion offset at an end thereof and approximately at right angles thereto, a bracket having opposite lugs pierced to receive the side of the U nearest the shank of the lever, thereby mounting the lever for rocking motion with the opposite side of the U moving in an arc, a contact spring overlying each of the opposite sides of said opposite side of the U in the directions of arcuate movement thereof and each said spring adapted to be flexed in a corresponding one of said directions when the lever is rocked accordingly, and additional contact means electrically cooperable with each of said contact springs, as a function of the aforesaid flexure thereof, for circuit control responsive to opposite rocking of the lever.

3. In a ball switch of the class described, an elongated operating lever having a right-angular offset at an end thereof, a bracket mounting said offset to support the lever for rocking motion, an additional offset from said first-mentioned offset disposed to move arcuately responsive to rocking of said lever, a pair of approximately parallel contact springs mounted on the bracket with said additional offset disposed therebetween such that opposite arcuate movements of said additional offset will flex one or the other of said springs away from the companion spring of said pair depending upon the direction in which said lever is rocked, and at least one contact spring mounted on said bracket for electrical cooperation with one of the contact springs of said pair as a function of the aforesaid flexure thereof.

4. A double throw stack switch comprising a base bracket, a stack switch mounted on said bracket, said switch including a pair of adjoining intermediate contact blades and at least one outer companion contact blade associated with each said intermediate blade, an endwise offset on said bracket including opposite pierced lugs situated approximately opposite the free ends of said intermediate blades, a stiff operator wire having a U-shaped end portion, one leg of which is pivotally seated in the pierced parts of said lugs and another leg of which is eccentric of the pivotal axis of the first leg, said other leg lying in between the free end regions of said intermediate blades such that the latter may be flexed in opposite directions to contact their companion blades by opposite pivoting movements of said operator wire, the latter having an offset end portion constituting an engaging part for pivoting the operator as aforesaid.

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