

[54] **PIN-BALL SURFACE GAME DEVICE
HAVING LOCK-OUT BALL BUMPER**

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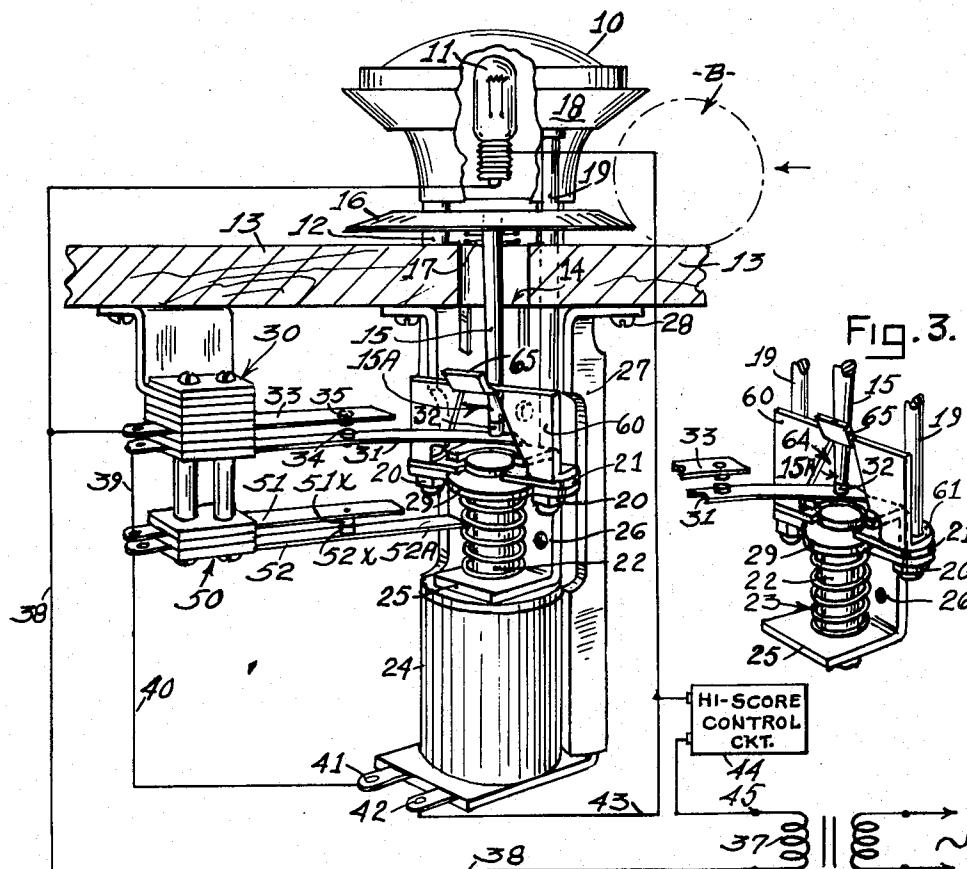
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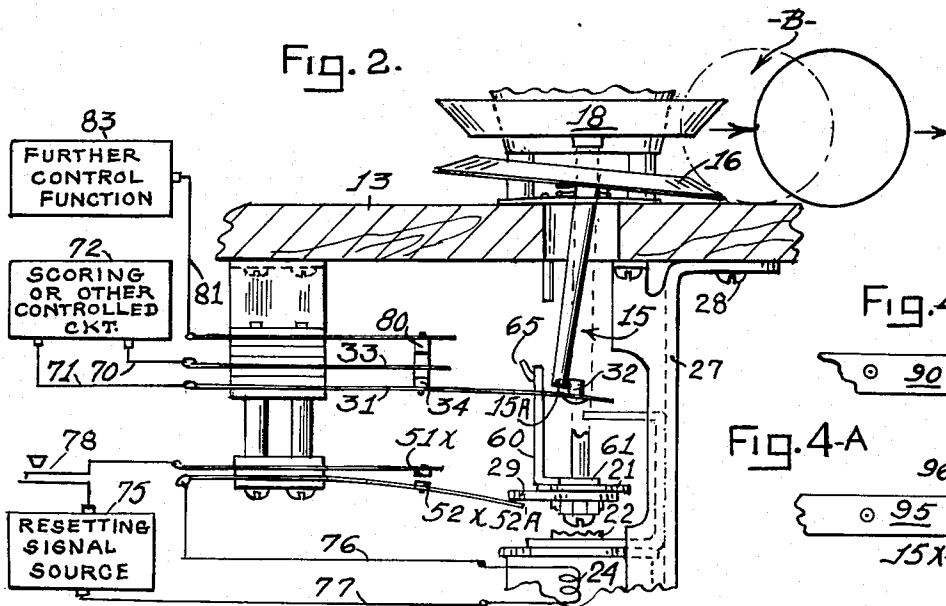
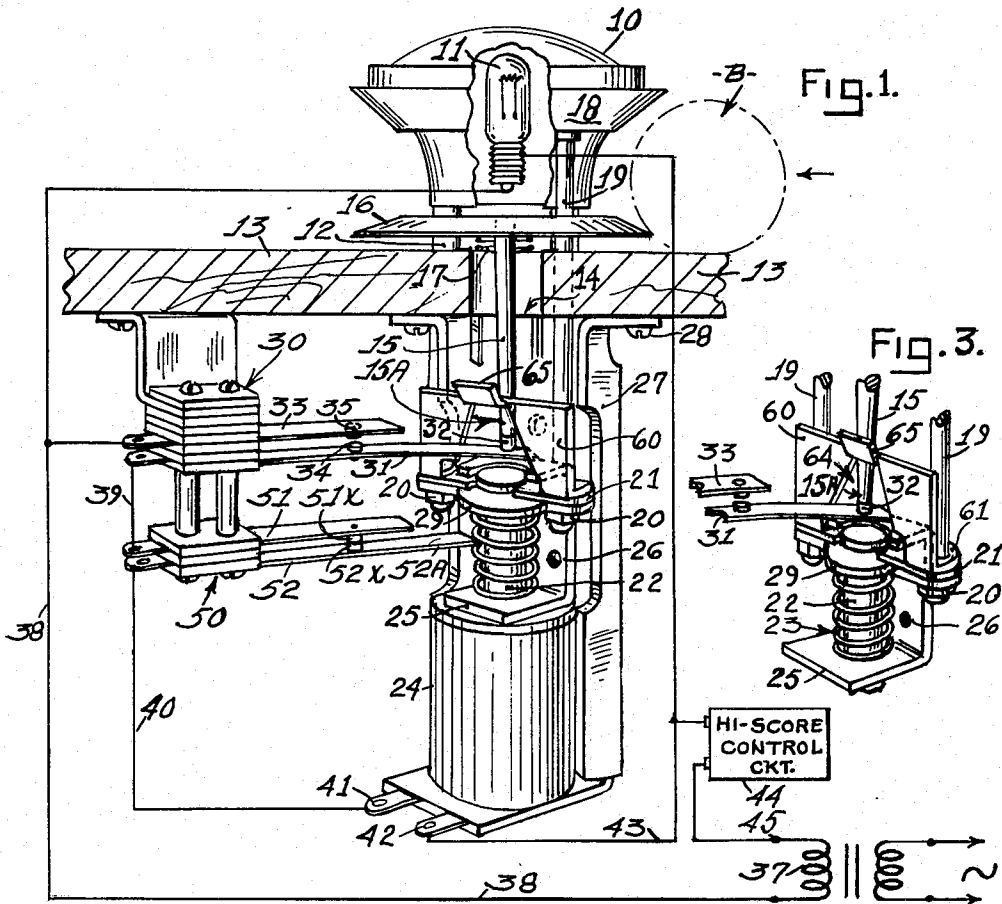
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[57] **ABSTRACT**

A ball bumper and switch means for pinball games and the like, wherein a blade switch is actuated by a pendantly rocked stem attached to a ball-rocked wafer or other target element. The improvements reside in a simple lock-out action between the stem and switch element which causes the switch to remain in operated condition until a resetting action is effected. Optionally, the lock-out action may be made directionally selective so that the switch means can be actuated by ball impact from any direction but the lock-out action will be effected only by impacts occurring in predetermined directions. A variety of game circuits and scoring arrangements can be controlled by the novel bumper switch means.

5 Claims, 5 Drawing Figures





PIN-BALL SURFACE GAME DEVICE HAVING LOCK-OUT BALL BUMPER

This application is a division of Applicant's pending application Ser. No. 286,003, filed Sept. 5, 1972 (now U.S. Pat. No. 3,826,883).

Ball bumpers used in so-called pinball and like ball-rolling games employing ball bumpers are known in numerous forms and many embodiments utilize some type of switch to control game scoring and a variety of novelty and "feature" functions and subcircuits, dependently upon impact of a ball on a rockable wafer, post, or other target element situated on the ball-rolling surface of the playfield and maintained by spring action in a normal position from which it can be deflected by ball impact.

Switches of the flexible-blade or "stack" type are commonly employed in such bumpers and are actuated by a pendant leg or stem projecting below the playfield from the wafer and rocked from a normal centralized position whenever a ball strikes and rocks the wafer, post, or other target element. Commonly, the switch-actuating leg can rock in any direction 360° about its normally-pendant central position, and usually the ball target or wafer can be struck and operated by a ball approaching the bumper from any direction about the center of such pendants central position.

One popular type of ball bumper, sometimes known in the art as a "Thumper Bumper", includes electromagnetic means for repelling the ball comprising a circular reprojecting disc or ring which is elevated normally above the ball target wafer and is snapped downwardly against the impinging ball by electromagnetic means as the result of actuation of the appurtenant bumper switch, the ball thereby being smartly reprojected back onto the playfield in further play.

Other examples of ball bumpers of the known reprojecting and pedestal types with ball-activated switch means are found in U.S. letters Pat. Nos. 2,276,748 (Thompson), 2,318,394 (Hooker), 2,487,979 (Neyens), 2,727,743 (Von Stoesser), 2,804,514 (Peters) and 3,180,646 (Zale). It is generally found necessary in commercial ball-rolling games to employ relays actuated by the usual bumper switch acting as a trigger because the signal produced by the bumper switch may be too rapid or uncertain due to fast or light ball action on the bumper trigger element, and such signals are accordingly unreliable particularly for positive activation of the ball reprojecting means.

According to the present improvements, a simple, rapid and sensitive lock-out means is provided to cooperate with the ball-actuated trigger part of the bumper combination and serves to produce a positive control signal which is particularly useful in connection with the illustrated type of reprojecting bumper, although the improvements are equally useful for other control purposes, and in general make possible the elimination of one or more relays and wiring otherwise required for prior reprojecting bumpers, and associated scoring or like instrumentalities, because the actuation of the bumper switch is rendered positive by the lock-out action in preventing self-return of the bumper stem to normal position until it is purposely caused to do so.

The disclosed improvements further afford a lock-out bumper switch means which is optionally directionally responsive in that a ball must approach the bumper target from some particular direction in order to effectuate the lock-out action, the switch means being oper-

ative also in all other intended directions of ball approach.

While the illustrative bumper is of the well-known reprojecting "Thumper Bumper" type, and the switch-resetting action is derived from the electromagnetic driving means which activates the ball reprojecting means in response to a hit upon the target, it is to be understood that the resetting action can be achieved by other arrangements omitting the reprojecting ring, for example, or by any agency operative to move the locking switch element so that the locked bumper stem element can be released for return to normally centered condition.

The foregoing and other aspects of novelty and utility characterizing the invention will appear more fully as the following specification proceeds in view of the annexed drawing in which:

FIG. 1 is a vertical perspective, with parts shown in section, depicting a reprojecting type of ball bumper embodying the improved switch means and certain control circuit connections therefor;

FIG. 2 is a fragmental elevational detail of certain parts seen in FIG. 1, but shown in an operated condition and with modified control circuitry;

FIG. 3 is a fragmental perspective detail illustrating parts of the switch resetting means;

FIG. 4 is a fragmental plan detail of a modified lock-out switch blade having directional characteristics;

FIG. 4-A is a fragmental plan detail of another modified lock-out switch blade having still further directional characteristics.

As depicted in FIG. 1, a known type of ball bumper may comprise a dome structure 10 of translucent plastic housing a lamp 11 and having footing means 12 fitted onto the usual ball-rolling panel 13 in which is an opening 14 through which depends a switch-actuating leg or stem 15, the upper end of which is attached to a ball-rocked target wafer 16 yieldingly elevated relative to the ball-rolling surface to a normal centralized position by spring means 17, all in a known manner, such that when a ball -B- strikes the bevelled edge of the wafer or target element the latter will be rocked in the manner indicated in full lines in FIG. 2, and the stem 15 will correspondingly be deflected sidewise from its normally centralized position with consequent switch-actuating functions to be described.

Aligned above the ball wafer 16, FIG. 1, is a reprojecting means which may take the form of a metal ring 18 supported by a pair of metal rods 19 passing downwardly through suitable holes in the panel for attachment, as by nuts 20, to a metal plate carrier 21 (FIG. 3 also) attached to the upper end of a solenoid plunger 22 movable against a normalizing spring 23 into the bore of an electromagnetic solenoid 24. This plunger assembly, in turn, is joined to a metal bracket 25 (FIG. 3, also) attached by screw means 26 to a larger suspension bracket 27 for the solenoid which is secured by screw means 28 to the underside of the playfield panel.

The operation of the foregoing solenoid means is such that when the coil is energized the plunger 22 is drawn sharply downward and the ball-reprojecting ring 18 follows downwardly by reason of its attachment to the plunger structure by rods 19, with the result, illustrated in FIG. 2, that the slanted rim of the reprojecting ring 18 impinges upon the ball, as shown in dash-dot lines in FIG. 2, to throw the ball more or less violently

back onto the playfield on a new course, as indicated by the ball shown in full lines, this much of the reprojecting bumper structure and operation being well-known in the art.

Two switching devices are included in the illustrative bumper structure, an upper switch unit 30 designated for convenience the "bumper switch", because it is ball-activated, and a lower switch unit 50 designated the "breaker switch", because it opens the solenoid circuit near the end of the plunger stroke, both of these switches being preferably of the simple spring blade or "stack" type wherein the contact blades are secured at one end in a stack of insulating wafers secured to the underside of the playfield, while the respective free ends of the blades project into space for flexing in switching action, it being understood that more than two contact blades can be arranged in any stack for co-active switching action.

One aspect of the novel lock-out bumper switch means afforded by the present disclosures, as illustrated in FIG. 1, relates to the upper switching unit 30 wherein the longer switch blade 31 is provided near its free end with a lock-out button 32 (FIG. 2, also) which may be of cylindrical shape approximating in diameter the diameter of the lower free end 15A of the wafer stem. The upper axial end of this lockout button constitutes a land which is juxtaposed with the free end portion 15A of the wafer stem when the latter is in its normally centralized condition, and the switch blade 30 is biased to dispose this land into contact with the said free end portion to hold the switch contacts 34, 35 in open-circuit condition until the wafer is ball-rocked to deflect the stem and its free end from the land and permit the blade to spring upwardly into contact-closing condition. This blade action disposes the lock-out button in a position illustrated in FIG. 2, to block the end of the wafer stem against restoration to its normal position with the result that the bumper switch remains locked up in operated condition, which may be either a closed- or open-circuit condition depending upon the relative positioning of the upper and lower switch blades 33, 31 for normally open or closed-circuit relationship, FIG. 1 illustrating the normally open-circuit condition of these contacts.

The bumper switch means 30 may be employed to control a variety of circuits, one of which is illustrated in FIG. 1 by way of example. Closure of contacts 34, 35, as aforesaid, causes energization of the solenoid coil 24 from a power source such as transformer winding 37, conductor 38, contacts 34, 35 (when closed by ball action as aforesaid), conductor 39, normally closed breaker contacts 51, 52 of another solenoid or supervisory breaker switch means 50, conductor 40, to one terminal 41 of the coil 24 and thence from terminal 42 via conductor 43 and a known type of feature control circuit means 44 designated as "Hi-Score Control Ckt.", to the remaining terminal 45 of the transformer winding 37.

The "Hi-Score Control Ckt." may be any optional game feature or subcircuit which conditions the particular bumper shown for reprojecting action at some phase of the game cycle, which condition is signalled to the player by illumination of the bumper lamp 11, so that when this lamp is lighted the player knows that the bumper is effective for scoring action and ball reprojecting purposes.

Thus, in this illustrative circuit arrangement, the closure of bumper contacts 34, 35, described above, results, when the feature control circuit is effective, in energization of the reprojecting solenoid and ring means 24, 18, to propel the activating ball back into board action, and as the solenoid plunger 22 reaches the end of its stroke an insulated wafer 29, carried at the head of the plunger, bears upon the free end 52A of the long supervisory switch blade 52, breaking the solenoid power circuit at contacts 51X, 52X and deenergizing the solenoid.

At this juncture, the bumper switch is automatically reset by means of a resetting bracket 60 which may be in the form of the simple stamping shown in FIGS. 1 and 3, having an offset base flange 61 secured to the plunger assembly plate 21 by the nuts 20 employed to retain the supporting rods 19 for the reprojecting ring. The resetting plate 60 has a central punched-out opening 64 through which the free end of the elongated bumper switch blade 31 projects, FIG. 3, together with a remnant punching tab 65 struck upwardly at an angle (see also FIG. 2) to provide a smooth and widened blade-engaging surface.

FIG. 2 discloses another game control circuit embodying the improved bumper switch means, wherein the bumper switch contacts 34, 35, instead of controlling the reprojecting means directly, are connected via conductors 70, 71 to control another game element or subcircuit 72 designated "Scoring Or Other Controlled Ckt.", and the resetting function is effected responsive to energization of the solenoid 24 from still another game subcircuit 75 designated as "Resetting Signal Source", the normally closed breaker switch contacts 51X, 52X being in series with a source of resetting signal power to the solenoid coil 24 via conductors 76, 77. In this circuit the resetting signal source may be a manual switch 78 actuated by the player at the instant the ball strikes the bumper target or wafer to procure a sort of "Flipper" bumper action ("Flipper" being a term of art), the intent being to exercise skill in energizing the reprojecting means at the proper instant to cause a reprojecting, which if the timing fails, will nevertheless reset the bumper switch.

FIG. 2 further illustrates the use of multiple control contact means for the bumper switch by the addition of another contact element 80 connecting via conductor 81 to still another game subcircuit means 83 designated "Further Control Function".

In this embodiment, when the bumper wafer 16 is struck and the switch 30 is operated and locked out, the score register circuit or other subcircuit means 72 will be actuated and an interval is allowed during which the player may actuate the manual reprojecting switch means 78 such that, if the ball is still within the range of the reprojecting ring 18 and the manual switch is actuated in time, the ball can be reprojected or not as the player chooses, and if not, this bumper circuit will remain available for reprojecting should the ball again approach this particular bumper for the purpose. A master resetting signal is applied at the end or beginning of each game cycle to restore any locked out bumpers.

The switch lock-out means may be made directionally selective to add interest and skill factors to various game board arrangements, as illustrated by the modified construction of FIG. 4 wherein the elongated wafer-actuated contact blade 90 has an enlarged and con-

cavely-dished end portion 91 such as is employed in a widely used type of ball bumper switch disclosed in U.S. Pat. No. 2,487,979.

In this dished type of switch blade the bumper stem 15X is normally centered over the center of the circular concavity and the stem is free to move in any direction from this normal central position to engage radially closer wall portions of the concavity and thereby operate the switch. In this modified construction of FIG. 4 one side portion 93 of the concavity is removed (or struck down) to provide a smooth riding edge to a depth such that if the wafer stem 15X moves away from centered position within a range of as much as 40° the end of the stem can move beyond the margins of the concavity and thereby become blocked in the manner illustrated in FIG. 4.

Still another modification of selective locking or holding action is depicted in FIG. 4A wherein a suitably widened stem-engaging button member 96 is disposed near the end of the switch blade 95 and upon the top land 96A of which the free end of the wafer stem 15X would normally rest in the manner of the stem shown in FIG. 1. But in this selective locking embodiment, one or more side portions 97A, 97B of the button are cut away or of lesser radial distance from the center of the land, with the result that when the wafer stem is deflected sufficiently beyond the margins of these relieved or narrowed side portions the stem 15X will be blocked and locked out, as depicted in FIG. 4A, it being evident that such selective configurations of the button can be located at any point about the center of the land to render the action selective in some desired direction or more than one direction. The resetting means and action for such directionally-selective modifications may be the same as for the construction of FIG. 1.

In prior reprojecting apparatus of this type it has been necessary to employ relays sensitive enough for control by the relatively fast and often weak pulses from the wafer or ball switch in order to assure a reliable and sustained heavy-current pulse for the solenoid to produce a positive full-stroke response of the latter. Without relays the ball switch pulses are commonly fluttering, impositive, and too rapid to be depended upon to actuate the reprojecting means or score register with every hit. In part, this characteristic is sometimes relied upon as a playing hazard of the game in the respect that it is required that any scoring ball must strike the bumper wafer energetically and in a head-on rather than glancing approach; othertimes, the hit is not scored. But relays are commonly employed even under such conditions, because they can be adjusted to respond to marginal as well as strong ball hits, and one of the important advantages of the lock-out means, apart from eliminating relays, resides in the fact that the stack switch can be utilized with only the simple addition of the lock-out button of FIGS. 1 and 2, or the marginally cut or formed "land" arrangements of FIGS. 4 and 4A.

We claim:

1. A bumper for pinball games having a ball-rolling panel and means for launching a ball for movement thereon, said bumper including a pedestal member adapted to stand in upright relation to the ball-rolling surface with a vertical axis approximately normal to said panel and having a target element in the form of a trigger disc circumambient of the pedestal and yield-

ingly spring-urged into a normal position to lie in a plane substantially at right angles to said axis adjacent said surface for engagement and tilting from said normal position by a ball, said target element including a central stem projecting freely through said panel with a lower end disposed in a normally pendant condition along said axis for cooperation with switch means beneath the panel; switch means disposed adjacent said lower stem end and including an elongated actuating member having a free end disposed beneath said lower stem end and provided with means yieldingly urging the actuating member to move said free end toward the said stem end; lock-out means comprising a formation at said free end of the actuating member providing an area constituting a land of predetermined small area engageable with said lower stem end in the normal pendant condition of the latter whereby said switch means is maintained in a first operated condition, the area of said land being such that the stem end will escape therefrom responsive to movement of the stem a small amount from said normal position when said trigger disc is tilted by a ball, said lock-out formation including a blocking portion adjoining said land and effective to block movement of the stem end back onto the land whereby the switch means is maintained in a second operated condition until said actuating member is reset by movement of the free end region thereof, at least, in a direction axially away from the lower stem end a distance permitting the stem end to clear said blocking portion; and resetting means operative to displace the actuating member in reset movement as aforesaid.

2. A bumper structure according to claim 1 further characterized in that said lock-out means comprises a small cylinder member affixed to the free end of the actuating member with the cylindrical axis aligned with the axis through said stem, the cylinder having an axial end confronting the stem end and the diameter of the cylindrical member being less than the maximum range of displacement of the lower stem end in order to permit said end to escape said land to blocked condition, the sidewall of said cylinder constituting said blocking portion.

3. A bumper structure according to claim 1 wherein there is further provided a ball reprojecting ring and means extending from below the panel to support said ring freely encircling said pedestal for movement from a normally elevated position above a ball engaging said trigger disc into reprojecting engagement with such ball, and electromagnetic means below said panel and operatively connecting with said supporting means and operative responsive to energization to move the ring downwardly in ball reprojecting action as aforesaid, said drive means being arranged and constructed to impart resetting movement to said actuating member as a cofunction of reprojecting movement of said ring.

4. In a ball-rolling game including a ball-rolling panel and means for launching a ball to roll thereon, directional ball bumper means comprising a pedestal upstanding from the ball-rolling surface of said panel; a tiltable target member extending around a lower portion of said pedestal and spring-urged to lie in a normal position approximately parallel to the plane of said surface adjacent the pedestal at a level to be engaged and tilted by a ball rolling thereon; an elongated stem having attachment with said target member and extending freely through the panel and lying along a predetermined axis in said normal position of the target mem-

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ber; a spring blade affixed at one end beneath the panel and having a free end disposed beneath the lower end of said stem and urged by spring bias of the blade toward said stem end; a directional lock-out formation disposed at said free blade end in alignment with said axis and including a small land area having a center aligned with said axis and engaged by said stem end in the normal position thereof along said axis whereby the blade is maintained in a first operated condition; said land area being of predetermined size radially away from said center and axis such that ball-effected tilting of the target member will displace the lower stem end in directions radially outward from said center, said land having a dimension in at least one radial direction shorter than other portions thereof enabling said lower

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stem end to escape the land and assume a second operated condition responsive to said bias; said lock-out formation having a blocking portion in the direction of said shorter radial dimension which blocks return of the stem to said normal position on the land unless the blade is reset by flexure away from the stem end far enough for the latter to clear said blocking portion; and electrical circuit means controlled in respectively first and second states by said blade in said first and second operated conditions thereof.

5. The ball bumper of claim 4 further provided with electrically actuated reset means controlled by said circuit means in said second state for effecting reset flexure of the blade as aforesaid.

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