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D. E. HOOKER ET AL

2,322,091

BALL BUMPER

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Fig. 1.

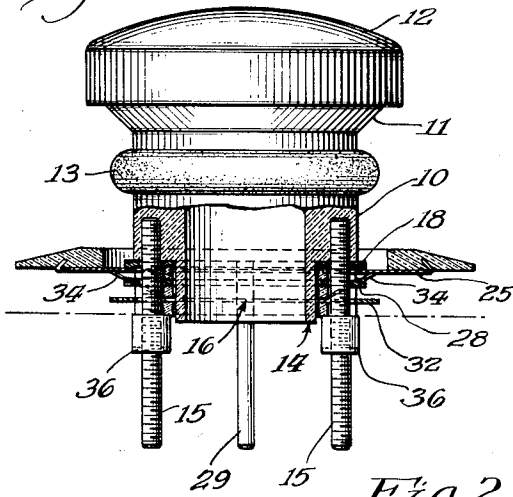


Fig. 2.

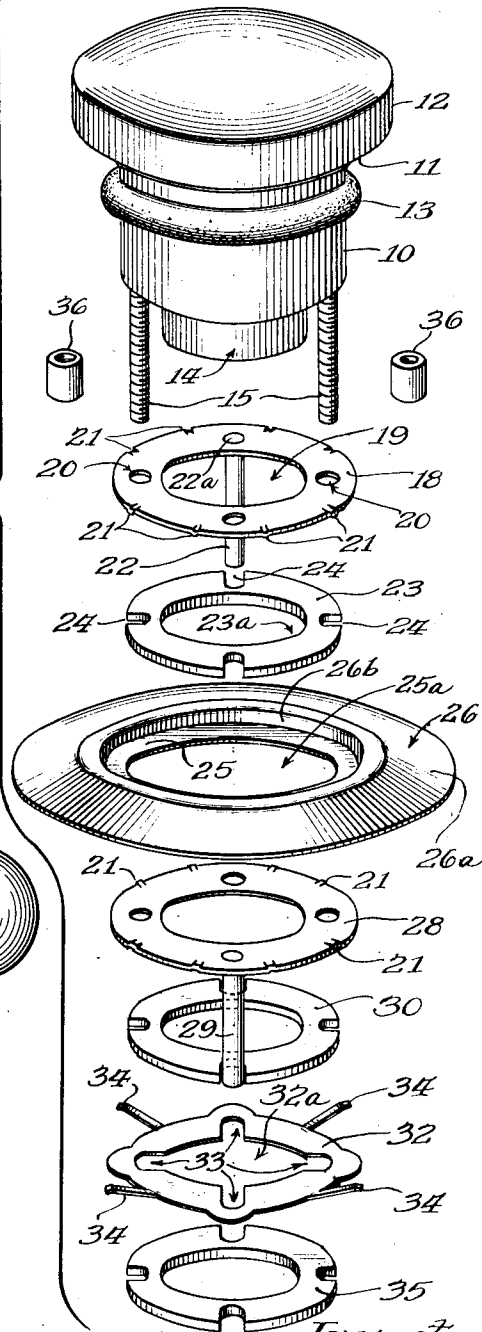


Fig. 3.

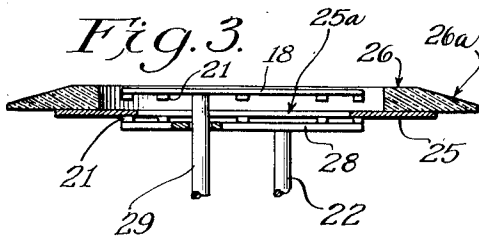


Fig. 4.

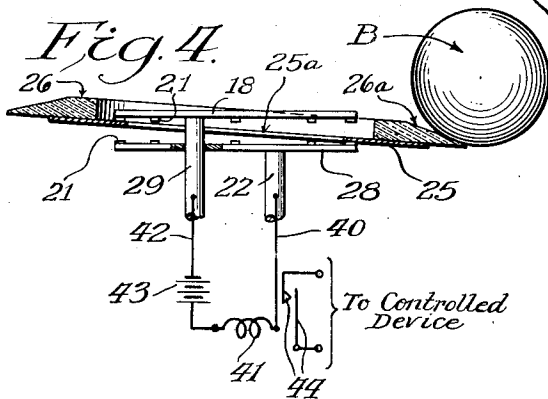
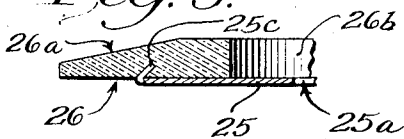


Fig. 5.



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## UNITED STATES PATENT OFFICE

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## BALL BUMPER

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9 Claims. (Cl. 200—52)

This invention pertains to amusement apparatus and special-application switch means in the nature of a ball bumper adapted for mounting on a ball rolling field as an obstacle or target to balls played thereon, and characterized further by the provision of switch means actuated by a ball in striking the bumper whereby to actuate an electrically controlled score indicator or other adjunct of the game.

The objects of the invention are to provide increased sensitivity and uniformity of both electrical and mechanical response in the switch means; to provide a structural assembly which will lend itself to economical and expeditious production; to provide a switch element adapted to be engaged by a relatively heavy steel ball without danger of injury or deformation of said structure; to provide an efficient contact means cooperable with the ball-operated parts of the switch; and to provide a switch element comprising a conductive portion in the form of a floating metal wafer of relatively good electrical conductivity adapted to be rocked across a pair of contacts to close a circuit, and a non-conductive skirt or rebound element secured to the wafer so as to be engaged by a rolling ball to rock the wafer in switch-action and to permit the ball to more effectively engage the bumper parts for rebound and lively ball action.

Other objects, advantages, and aspects of novelty and improvement reside in certain details of the construction and operation of the preferred embodiment described in the following specification and accompanying drawing in which:

Fig. 1 is an elevation of the bumper with portions shown in section;

Fig. 2 is an exploded perspective of the elements of the switch;

Fig. 3 is a vertical fragmentary section of the switch contacts, wafer, and skirt;

Fig. 4 is a view similar to that of Fig. 3 with a schematic circuit added to illustrate the operation of the device;

Fig. 5 is an enlarged sectional fragment showing attachment of the wafer to the skirt;

Ball bumper switches are known in various forms, the type described herein being familiarly known in the art as a wafer type bumper because of the fact that it includes a movable disc or wafer which lies close to the surface of the playing field so that a ball may roll thereon and by its weight rock the wafer to actuate the switch means.

In the prior Patent No. 2,218,968 of Donald E. Hooker, applicant herein, there is disclosed a

wafer bumper of construction analogous in a broad sense to that shown herein, one of the differences being the fact that in the previously patented device the wafer consists of a very thin piece of steel shim which rested by gravity against the lowermost one of a pair of vertically spaced contact rings.

When a heavy steel playing ball strikes such a thin wafer, the wafer frequently tends to bend and give way to the ball. In some arrangements this is an advantage insofar as the effort of the wafer to spring back to original condition provides additional rebound effect acting on the ball. However, for many types of game, such an arrangement is far too sensitive because the wafer is almost feather light and responds to the slightest touch of the ball.

In order to control the sensitivity of response of the wafer, and to procure new rebound effects, the present invention preferably suspends the wafer on spring means which holds the wafer in an elevated or floating condition. Moreover, the wafer is provided with a solid reinforcing and rigidifying member having a sloping edge onto which the ball may climb to strike the bumper and at the same time depress or rock the wafer contact element.

Referring to Fig. 1, the bumper consists of a base member 10 formed as a tubular post of translucent plastic. This post terminates upwardly in a flared housing portion 11 covered by a removable cap 12. It is intended that an electric lamp and its holding socket be mounted within this housing portion so as to illuminate the entire structure from within, the cap 12 of course also being translucent to this end.

The outside of the post portion 10 is grooved circumferentially to seat a rebound element in the nature of a rubber tyre 13, which is adapted to be struck by a rolling ball under circumstances later to be described.

Adjacent the bottom of the post is a portion 14 of reduced diameter (see Fig. 2 also) which constitutes a mounting for the switch elements, which mounting includes a pair of diametrically opposite, threaded legs 15 each molded in the post so as to extend collaterally with the reduced portion for purposes to appear.

Centrally of the post is a bore 16 into which an electric lamp may be projected.

The switch means is best described by reference to Fig. 2, where it is shown to include a first contact element in the preferred form of a brass ring 18 with a central hole 19 to fit around the reduced portion of the post. This contact ring

also has diametrically disposed holes 20 for passage of the screw legs 15. Of importance also are a plurality of contact formations 21 formed around the periphery of the ring by stamping. These formations 21 in effect constitute contact points as distinguished from the extensive contact surface which the ring would otherwise afford.

Extending downwardly from contact ring 18 is a connecting leg or pin 22 staked into the ring at its upper end 22a.

Next in the assembly of switch elements is an insulating ring 23 with a central post embracing opening 23a and four punchings 24 in its outer rim to afford passage to the screw legs 15 and contact legs like the pin 22.

The next element in the assembly is the wafer, which consists of an annular metal disc 25, preferably of a good electro-conductive metal such as brass. This disc is secured to a ball-engaging skirt 26 of plastic and also of annular shape with a beveled or sloped ball engaging and roll-off edge 26a (Figs. 4 and 5 also). The metal annulus is very thin and has a central passage 25a for the post while the plastic annulus or skirt has a somewhat larger central passage 26b larger in diameter than the disc passage 25a or the rings 18 or 23.

A second contact ring 28 identical to ring 18 is disposed below the wafer structure with its contact leg 29 disposed diametrically opposite the leg 22 of ring 18. Then follows another insulating ring 30 identical to ring 23.

The last major element of the switch assembly, and an important one, is a spring means for maintaining the wafer contact disc 25 in a resiliently elevated condition out of electrical contact with the lower one 28 of the two contact rings. This means takes the preferred form of a spider 32 of spring metal of approximately annular form with a central punching 32a to fit around the post, and four leg passage punchings 33. Spaced equidistantly around the outer periphery of the spider in alternation with the leg punchings, are upwardly biased spring fingers 34 which are adapted to press against the wafer disc and hold it in elevated condition (see Fig. 1), so that the wafer structure floats, in a manner of speaking.

The assembly is completed by the application of a last insulating ring 35 identical to rings 23 and 30, threaded retaining collars 36 being screwed up tight against the underside of this last ring on legs 15 so as to secure the entire complement of switch elements shown in Fig. 2 in the assembled condition shown in Fig. 1.

In use, a plurality of these bumpers may be mounted on the inclined surface of a ball rolling game in a manner well known in the art, and for this purpose a large central hole (corresponding to the bore 16 in the bumper) is drilled in the game board so that an electric lamp may be disposed to cast light into the bumper on occasion. Also four smaller holes are drilled to receive the legs 15, 22 and 29, and attaching nuts are finally threaded onto the legs 15 to hold the bumper in position. All of this is well known in the art and needs no illustration here, except that it may be of interest to point out that the dash-dot line in Fig. 1 designates the top surface of the playing field, from which it will be evident that the wafer element is spaced vertically from said surface so that it may tilt when struck by a ball in the manner illustrated in Fig. 4.

Normally, the wafer element (consisting of the

metal annulus 25 and its plastic annular skirt 26) is resiliently held in the elevated condition against the top contact ring 18 as shown in Fig. 3, wherein the metal wafer part 25 is entirely free from electrical contact with the lower contact ring 28.

However, when a ball B rolling on the usual playboard strikes the beveled edge 26a of the plastic skirt, it tends to ride up onto said edge and by its weight rocks the wafer element into the position shown in Fig. 4, wherein the metal wafer part 25 bears against both the upper and lower brass contact rings 18 and 28, thus bridging the electrical gap therebetween and closing a control circuit.

In Fig. 4 the contact leg 22 is shown connected by a conductor 40 to one terminal of a relay coil 41, while the other contact leg 29 is connected by a conductor 42 in circuit with a source of electric power illustrated as battery 43 connected to energize the relay coil 41 when the normally open circuit across the two brass contact rings 18 and 28 of the bumper switch are closed as by action of a ball in the manner illustrated in Fig. 4.

When the relay coil 41 is thus energized, it closes its own relay switch 44 for the purpose of actuating or controlling some controlled device, such for example as a light, bell, or score counter, in a manner known in the art.

In Fig. 5 there is shown an enlarged section of the wafer element to illustrate one of the methods of attaching the metal wafer annulus 25 to the plastic skirt, namely, by providing upturned ears or tabs 25c at intervals around the outer periphery of the metal disc and placing the discs in the mold cavity in which the skirts 26 are formed, so that the plastic flows around and securely engages said ears 25c, thereby gripping the metal disc. In this method, also, there is some useful adhesion of the plastic to the metal surface if the latter is clean. In an alternative method, a suitable cement or agglutinate may be applied to the metal disc and the latter thereby simply "glued" to the skirt. Shellac and varnish and various resin base agglutinates may be successfully used.

In the prior device shown in the aforesaid Hooker patent, the metal wafer has no skirt and no rigidifying means; it must rest in its normally lowered, non-contacting position purely by action of the force of gravity. But such discs are necessarily made of thin or shim metal (usually about four to five thousandths of an inch thick) the weight thereof is so slight that its sensitivity is extreme.

Such extreme sensitivity is desirable in some kinds of ball rolling game but not in others. Also, the steel discs when used alone must be thin enough to be springy so as to give the ball a lively rebound action, and such rebound action is, in general, one of the desirable features sought in designing such bumpers.

If, however, the thickness of the metal wafer when used alone is materially increased so as to increase the weight and thereby adjust the sensitivity of the same as a switch, then the rebound effects are lost because of the rapid loss of resiliency of the discs as their thickness is increased. The requirement for springiness makes it necessary that the steel wafers be tempered somewhat, which materially increases the electrical resistance thereof.

It also happens in some games that a heavy steel ball may strike the thin steel wafer in

a manner to warp or dent the same and this presents a situation which usually requires servicing of the machine to replace the disc.

The thin, plain wafer cannot be used in all control circuits where a relatively heavy current is passed in its circuit, for arcing is likely to occur and the discs will thereby be welded to one or both contact rings sufficiently to prevent the light weight of the disc from breaking the weld.

The present invention provides a bumper which retains the desirable features of the patented Hooker bumper and yet enlarges the possible uses and applications and functional peculiarities thereof.

In the first place, the contact formations or punches 21 afford more positive make-and-break contacting with obvious advantage. In the second place, the sensitivity of the wafer may be regulated or predetermined by using spring spiders of various resiliency. Thirdly, a new ball action is achieved by providing the beveled edge 26a in combination with the spring action afforded by the spider, and in addition, the fact that the post structure and skirt are both of the same material (colored plastic) renders the bumper more attractive.

The assembly is easily and inexpensively constructed by ordinary stamping and molding operations; it is simple to adjust in operating position, and improved electrical performance is procured by virtue of the fact that spring steel need not be used for the metal wafer, but instead, a more conductive metal such as brass may be used with a resultant increase in electrical conductivity.

At this juncture it is desired to point out another feature of adaptability of the new bumper, namely the fact that in addition to the rebound effects to be procured by use of the floating wafer, still another mode of operation is possible by omitting the spider 32 and permitting the weight of the skirt 26 to hold the wafer structure in lowered position as shown in Fig. 3. It will be obvious that the action of the wafer in such an arrangement will be different from that of the steel disc used alone as the wafer, for in such a case the lightness of the disc gives one kind of action and sensitivity in both rocking and restorative movements; moreover, the flexibility and resiliency of the steel disc gives a certain kind of rebound action. In the case where the metal wafer is loaded and rigidified with a skirt having an inclined ball-action or beveled edge 26a, or the like, the action will be different. In the first place, the sensitivity is entirely changed, for the tendency of the steel disc alone is to flutter. In the second place the ball tends either to roll back directly from the beveled edge, or to climb directly until it strikes and rebounds from the rubber tyre 13, whereas the plain steel disc tends to flex and push the ball back.

It is, therefore, demonstrated that the useful aspects of the invention pertain to the arrangement of the metal wafer loaded with a rebound device or skirt, with and without the floating suspension by the spring spider.

The objects and advantages of our invention may very likely be realized in modified forms of construction, and it is therefore an express condition of this disclosure that, while we have illustrated only one commercial embodiment of our device, the claims which follow are nevertheless intended to embrace all such modifications,

and any and all rearrangements and variations of the specified construction fairly coming within their call.

We claim:

1. A bumper device comprising a post structure adapted for mounting in a ball rolling field, a disc-like structure mounted concentrically of said post for rocking motion from a plane approximately parallel to that of said field, contact means between which a portion of said disc structure is mounted, said structure including a conductive portion for closing a circuit between said contact means responsive to predetermined rocking movement of said disc structure, and means for resiliently suspending said disc structure in a normally elevated condition with respect to said field and a part of said contact means so that a playing piece in said field may engage said disc structure and spring the same in circuit closing action as aforesaid and effectuate rebound action of said structure.

2. The invention defined in claim 1 further characterized by the provision of an inclined rebound edge formation on said disc structure to procure predetermined rebound effects cooperatively with rebound action of said resilient suspension means.

3. The invention set forth in claim 1 further characterized in that said contact means comprises a pair of contact rings about said post and spaced apart vertically, and said disc structure comprises a metal disc arranged to rock in circuit-closing action as aforesaid between said rings, said metal disc having a non-conductive surface portion with a sloped edge portion disposed for engagement by a playing piece on said field.

4. A ball bumper including a post portion adapted for mounting in approximately upright position on a ball rolling surface, vertically gapped contact means arranged about said post and adapted to be connected in a control circuit, and a wafer structure disposed circumambiently of said post and including a metal member disposed between said contact means for rocking motion to bridge a connection across said gapped contact means and effect actuation of a controlled instrumentality in said circuit, and means for resiliently elevating said wafer structure with respect to said surface and with said metal member normally out of electrical contact with the lower contact means, such that a ball rolling onto said wafer structure will rock the same to actuate the controlled instrumentality as aforesaid and to be rebounded by restorative action of said elevating means.

5. A ball bumper comprising a post structure, spaced upper and lower contact means arranged circumferentially of said post structure and adapted to be connected in a control circuit, and a ball-engaged wafer structure including a non-conductive disc mounted concentrically of said post for rocking movement and having an outer edge inclined as a roll-off means for a ball, spring means normally and yieldably holding said wafer structure in a tensioned ball-engaging position, and conductive means moving co-planarly with said wafer responsive to rocking motion thereof when engaged by a ball whereby to bridge an electric connection between said upper and lower contact means and actuate said control circuit.

6. In a bumper of the class described including disc means mounted for rocking movement by action of a ball engaging the same, together with contact means across which a circuit is bridged

by rocking action of said disc means, the combination of a spring spider mounted to elevate said disc means into a floating condition to be depressably moved and rocked by a ball in the manner and for the purpose aforesaid.

7. In a bumper of the class described, a pair of upper and lower normally gapped contact rings, a contact element mounted to rock between said rings, and a plurality of integral raised contact points formed about said rings for contacting engagement with said rocking contact element.

8. The invention defined in claim 7 further characterized by the fact that said rocking contact element is a metal wafer, and said wafer is provided with a nonconductive circular skirt, having an outer edge portion sloped to provide a roll-away edge for a ball.

9. The invention defined in claim 7 further characterized by the fact that said rocking contact element is a metal wafer, and there is additionally provided means including a plurality of springy fingers normally and yieldably pushing said wafer into a raised position against the upper contact ring and out of contact with the lower contact ring, from which position the wafer is adapted to be moved to bridge a connection between both rings by rocking action of a ball as aforesaid and to effect a roll-away action of said ball.

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