

[54] **PINBALL GAME BUMPER ELECTRICALLY RESPONSIVE TO BALL IMPACT**

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[51] Int. Cl. **A63f 7/00**

[58] Field of Search **273/127 R, 129, 118 A, 273/119 A, 121 A, 122 A; 200/61.11**

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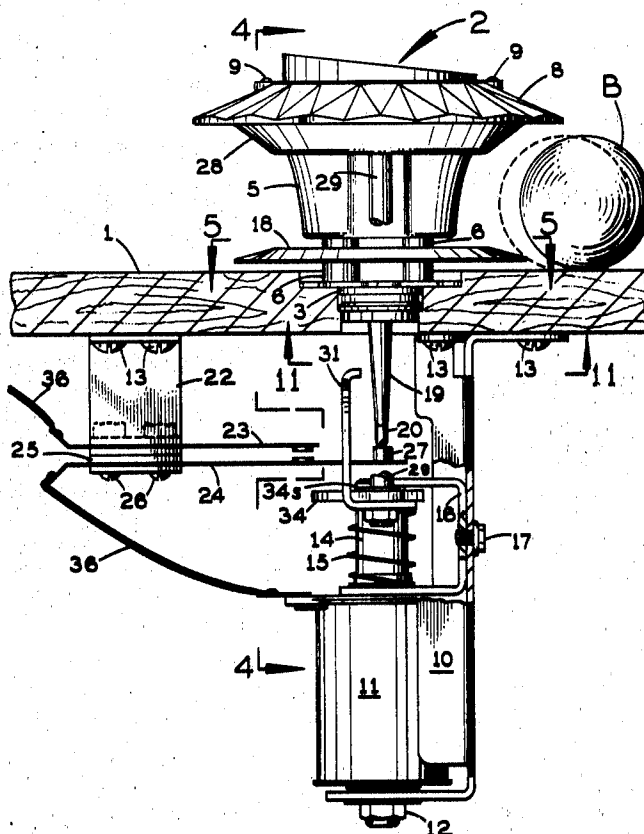
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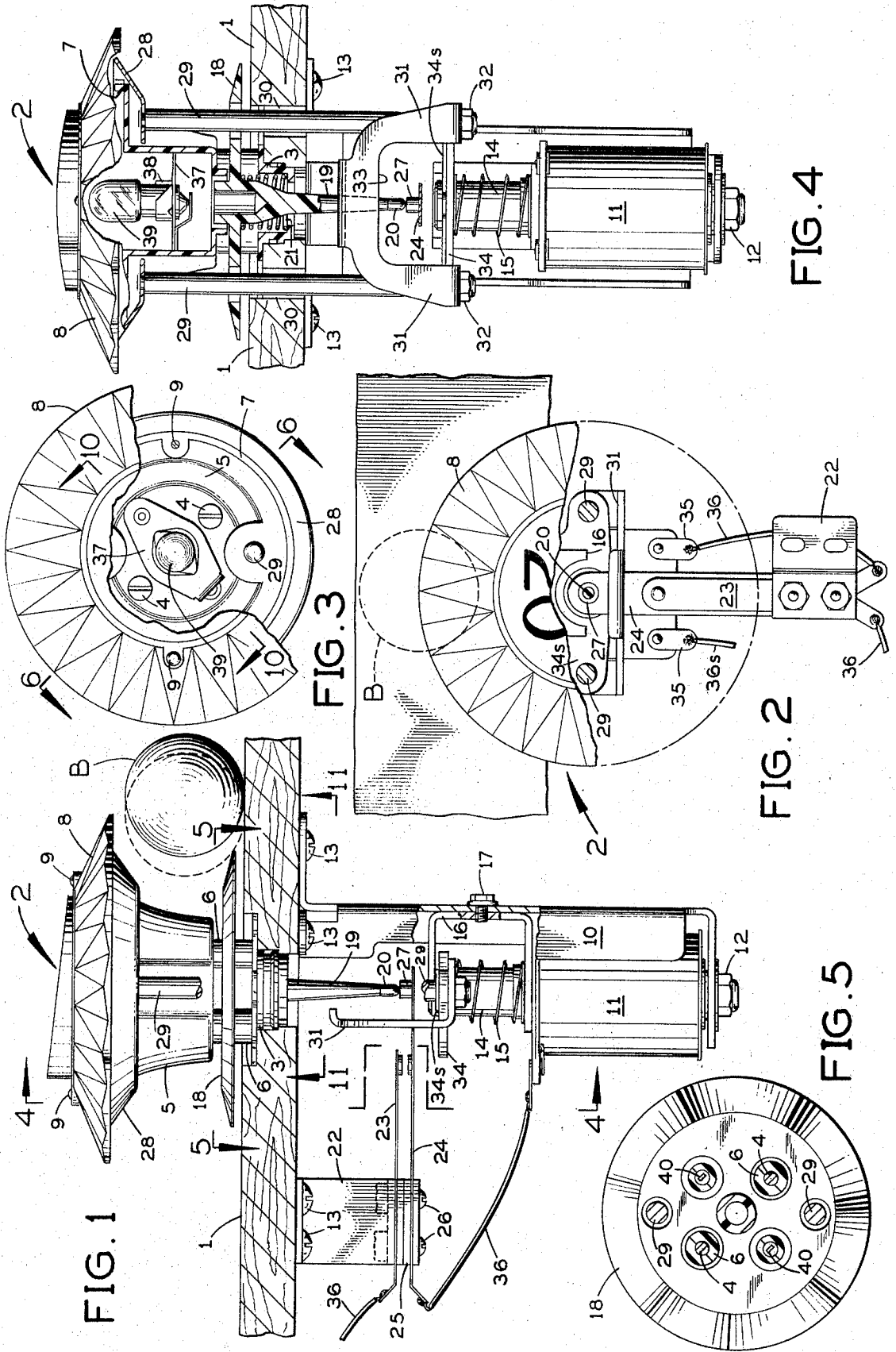
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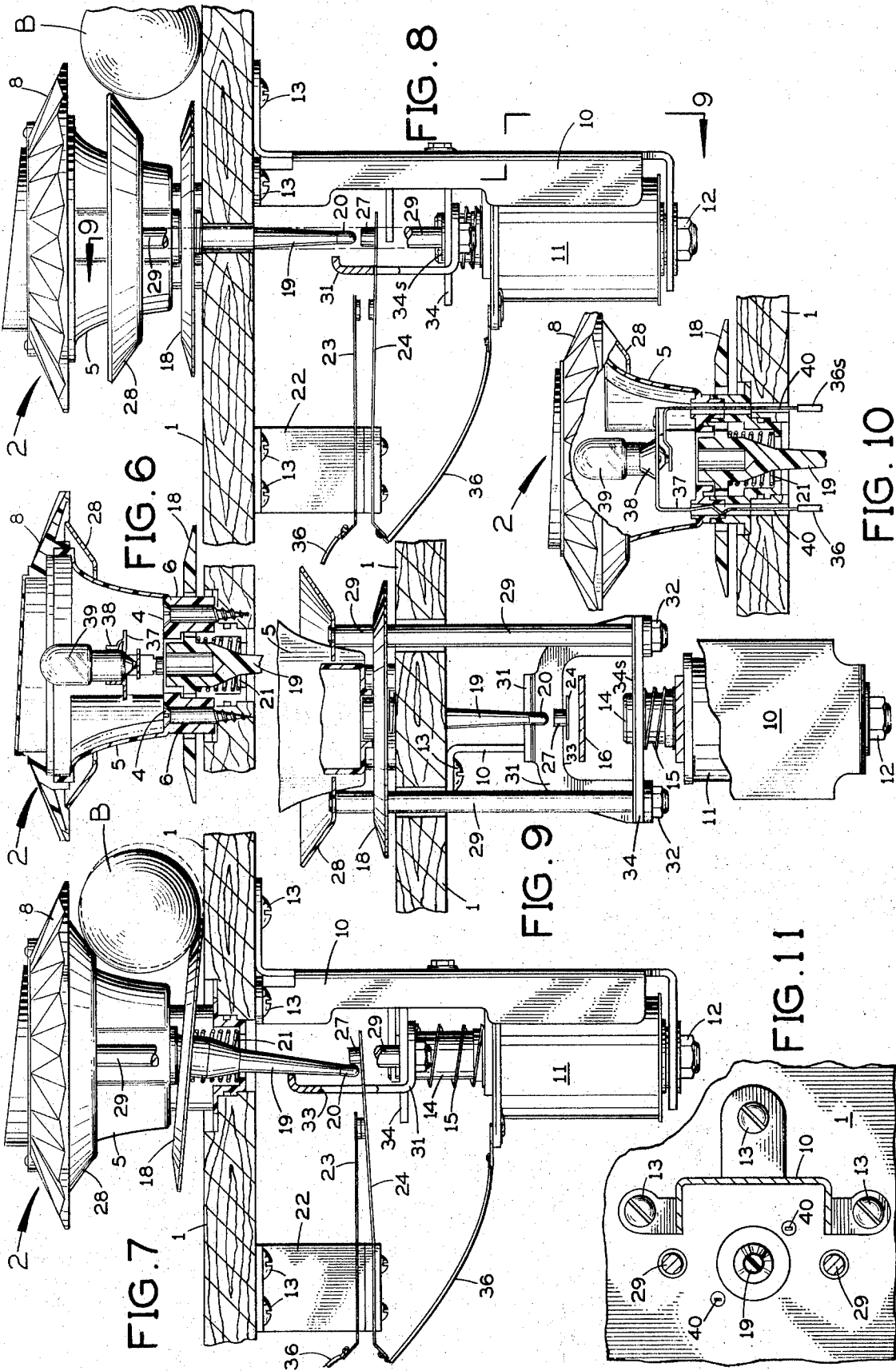
[57] **ABSTRACT**

A pinball game bumper assembly for receiving the impact of a ball from any lateral direction against a trigger element, the displacement of which element will operate and close a normally open electric switch for energizing a solenoid for restoring the bumper to its original idle position with the switch held open including a safety element for preventing successive ball impacts in a single game to operate the trigger element and switch, which also is adapted to energize a circuit to a scoring means.

5 Claims, 14 Drawing Figures







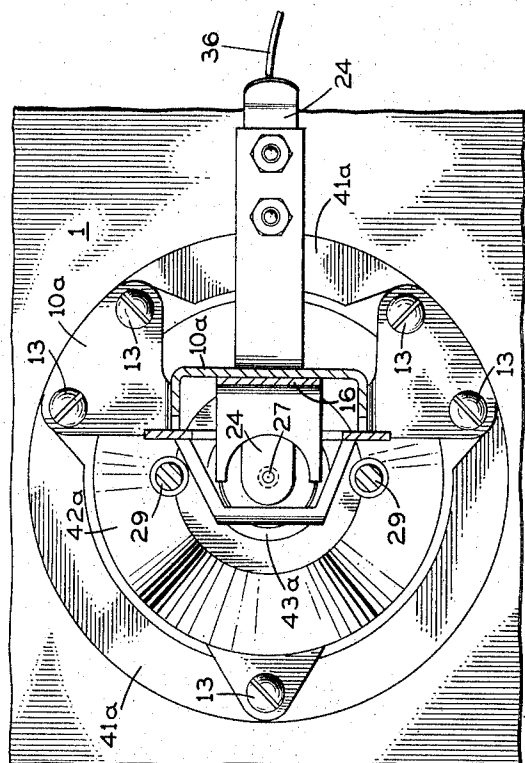


FIG. 13

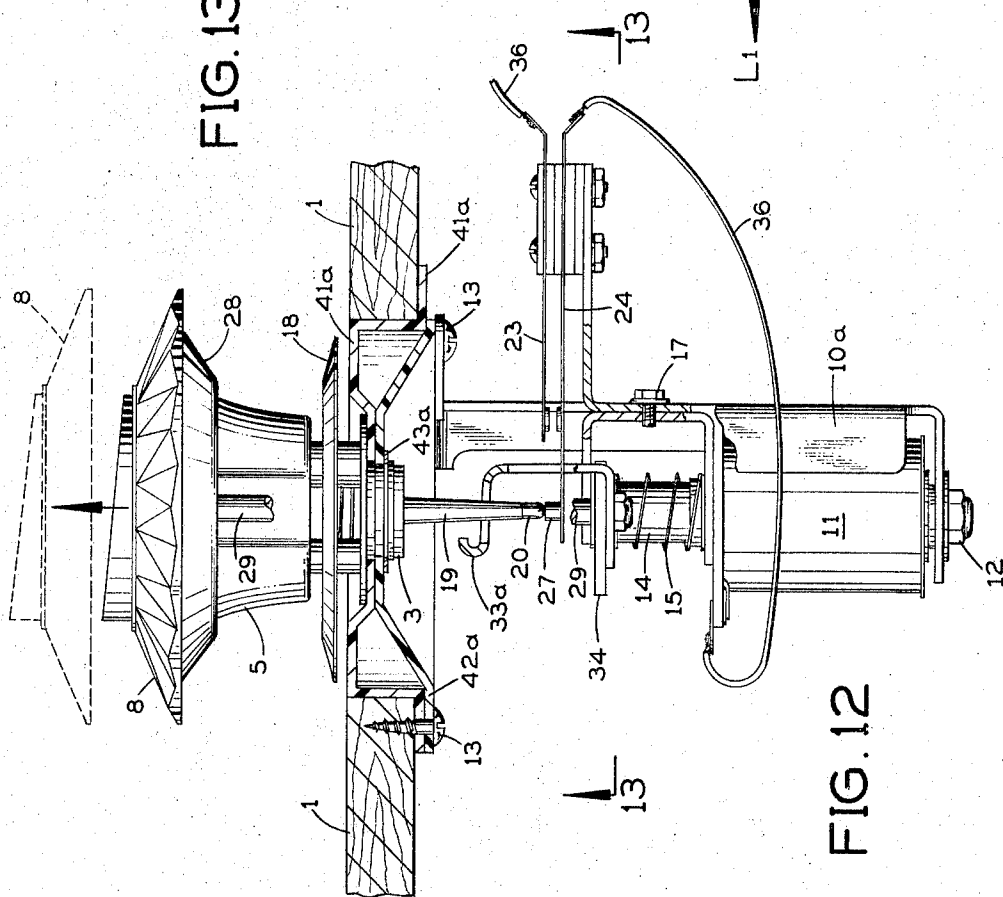


FIG. 12

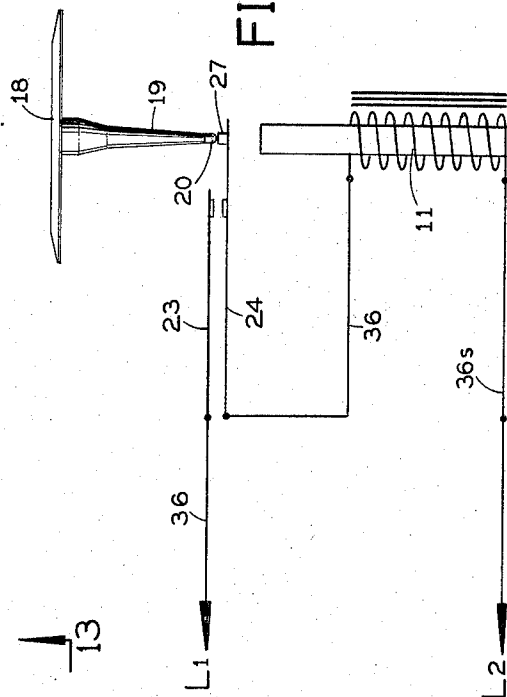


FIG. 14

PINBALL GAME BUMPER ELECTRICALLY RESPONSIVE TO BALL IMPACT

This invention relates in general to pinball games wherein a degree of skill is required to cause a ball to impact one or more bumpers for electrically establishing a visible score.

The electric circuit commonly used in connection with prior bumpers is relatively complex and requires the use of relays to energize portions of the circuit that results in operating a score read-out. Furthermore, prior bumpers assemblies were usually circular with a single impact surface around the surface thereof and the ball impact against the periphery was used to momentarily close an electric circuit for energizing the electric scoring means and other elements, which contact is not always sufficiently conductive to complete the operation of the circuitry.

The above objections and disadvantages are overcome by the provision of the present bumper assembly which includes three main members on the upper side of the pin gam board, the first of which is a pedestal fixed and projecting from the upper side of the board and in most instances has a signal light therein.

Another object of the invention is the provision of a coaxial impact disc normally positioned around the upper portion of the pedestal having a lower surface in the form of an upward sloping frustum of a cone, which frustum is adapted for predetermined vertical reciprocation when struck by the ball.

A further object of the invention is the provision of a second coaxial trigger member extending around the pedestal having an upper surface in the form of a downward sloping frustum of a cone and normally positioned a predetermined distance below the upper impact disc and adapted for tilting movement by the ball when the force of the ball is sufficient to raise the impact disc a predetermined distance.

A further object of the invention is the provision of an electric solenoid for raising an elevator assembly related to the impact discs and the trigger member and restored to a position holding an electric switch in open position when said solenoid is momentarily energized for raising the impact disc and the trigger member, which construction is a principal object of the invention.

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

FIG. 1 is a side elevation of the bumper and its control apparatus.

FIG. 2 is a top plan view of the bumper shown in FIG. 1 with a portion thereof broken away.

FIG. 3 is a top plan view of a portion of the bumper shown in FIG. 1 with a second portion of the top cover broken away.

FIG. 4 is a cross sectional side view taken through section line 4—4, FIG. 1.

FIG. 5 is a top plan view of the bumper, taken through section line 5—5, FIG. 1.

FIG. 6 is a cross sectional side elevation taken through section line 6—6, FIG. 3.

FIG. 7 is the same as FIG. 1 prior to the impact of the ball.

FIG. 8 is the same as FIG. 7 following the impact of the ball.

FIG. 9 is a side view of the elements shown in FIG. 8 and the solenoid therein energized.

FIG. 10 is a cross sectional side elevation taken through section line 10—10, FIG. 3.

FIG. 11 is a cross sectional bottom plan view taken through section line 11—11, FIG. 1.

FIG. 12 is a side elevation of an alternate board mounting assembly of the bumper shown in FIG. 1 and illustrating the removal of the bumper cap shown by dotted lines.

FIG. 13 is a bottom plan cross sectional view taken through section line 13—13, FIG. 12.

FIG. 14 is a schematic diagram of the partial electric circuit for restoring the bumper elements to their idle position.

Referring to FIG. 1, all visible elements of the bumper assembly 2 project above the upper surface of the board 1, which includes pedestal 5, display cap 8, trigger disc 18, impact disc 28 and vertical rods 29.

A cylindrical hole having an axis normal the surface of the board 1 is provided with two counter bores which are adapted to retain a collar 3 having an upper and lower flange resting on the lower circular surfaces of the counter bores. The collar is retained in place by a pair of screws 4 which serve to hold a hollow upward divergent pedestal 5 and collar 3 securely through a pair of opposite cylindrical pillars 6 extending from the lower end of pedestal 5, illustrated in FIGS. 1, 3, and 5. The upper end of the pedestal terminates in a coaxial upward extending flange 7 in which the numerical display cap 8 in the shape of a frustum of a cone is positioned within the upper edge thereof and retained by screws 9—9, illustrated in FIG. 3. Thus cap 8, preferably made of translucent plastic material, may be changed to substitute numbers or other desired data.

A channel shaped bracket 10 has three upper ears extending therefrom which are secured to the underside of the board 1 by screws 13—13, best shown in FIG. 11. Again referring to FIG. 1, the lower end of the bracket 10 is formed into a right angled offset to support a solenoid coil 11 with the lower end thereof retained to the offset by a nut 12. The core 14 of the solenoid is positioned for vertical reciprocation coaxial with the collar 3 and pedestal 5. A coil spring 15 around core 14 serves to urge the latter into its upper de-energized position.

An offset scalloped upward stop for core 14 is provided by sub-bracket 16 secured to the main bracket 10 by screw 17, as shown in FIGS. 1 and 2.

A circular plastic trigger disc 18 having an outer downward divergent rim includes a central generally downward tapered stem 19 coaxial with the underside of the disc and projecting therefrom, which stem terminates in a spherical tip 20 preferably made of wear-resistant material. The trigger disc is provided with a plurality of clearance holes for a passageway around pedestal pillars 6, for permitting the disc to tilt.

The stem of the trigger assembly is centered through the collar 3 when in idle position with the lower planar surface of the trigger disc 18 positioned a predetermined small distance above and parallel the surface of the board 1 when in idle position. A coil spring 21 around the stem 19 is positioned between the lower surface of the trigger disc 18 and the upper surface of the lower inner flange of the collar 3.

A second sub-bracket 22 is secured to the under side of board 1 by a pair of screws 13 for retaining a pair of

normally open switch blades 23-24 insulated by spacers 25 and retained by screws 26 to the right angled off-set end of the bracket 22. Blade 24 extends outward from blade 23 and has an upstanding cylindrical operator 27, preferably made of wear resistant material, and of predetermined height and positioned coaxial with the stem 19 when in its idle position and the tip 20 resting on the upper surface of the operator 27 for normally holding the switch blades in open position when the bumper assembly is in its normal idle position.

A circular impact disc 28 with a rim in the form of an upward divergent conical shape surrounds the pedestal 5 in equispaced relation and has secured therein a pair of oppositely positioned vertical rods 29-29, which are journaled for vertical reciprocation in like bushings 30-30 through board 1, best shown in FIG. 4.

The lower ends of the rods 29 are secured to a bridge bracket 31 by a nut 32 threaded on each rod, which bridge bracket has a contact edge 33 parallel the board 1 for operating switch blade 24 downward against its normal closing tension. The upper end portion of the solenoid core 14 is secured to the bracket 31 and rods 29 by a transverse member 34 retained between shoulders on the rods 29 and the bracket 31. Another transverse plate 34s has a slot therein for engaging a groove in the upper end portion of the core 14 for securing the core to the member 34. A pair of electric terminals 35-35 are secured to the coil ends of the solenoid. One of the terminals 35 is connected by conductor 36 to the blade 24 and a continuation conductor 36 connected to blade 23, as shown in FIGS. 1 and 2, the operation of which will be hereinafter described.

FIGS. 3 and 4 illustrate the optional use of an electric lamp signal for illuminating cap 8 when desired. A bracket 37 secured within the pedestal 5 retains a socket 38 for a miniature electric lamp 39 which will illuminate a translucent cap 8 when energized. A pair of terminals 40 of the lamp socket 38 project from the pedestal downward through a pair of opposite pedestal pillars 6 for connection to conductors such as 36 and 36s, as illustrated in FIGS. 5 and 10.

An alternate construction is shown in FIGS. 12 and 13 wherein the collar 3 which is in alignment with the principal elements is supported in a relatively large hole in the board 1 and secured by an upper standing 41a having a central hole for receiving collar 3 and a mating lower stamping 42a secured to the under side of the board 1 and also having a central coaxial opening for collar 3 which lower plate is held by five screws 13 with corresponding opposite ears 10a applied to the solenoid holding bracket. A C washer 43a is secured around collar 3 to firmly hold same in secure central relation with respect to stampings 41a and 42a, and provides a single unit bumper assembly.

It is to be noted that screws 29-29 are inserted through the upper flange of collar 3 in opposite direction into the pedestal pillars 6, shown in FIG. 6.

FIG. 14 shows the portion of a schematic electric circuit involving the restoration of the trigger disc with the switch blades 23-24 in open position following the momentary energizing the solenoid when the tip 20 of the stem 19 is displaced by the tilting movement of the trigger disc.

In operation and under the assumption that the bumper assembly is constructed as shown in FIG. 1, with the elements positioned as shown, ball B is in its ap-

proach to the pedestal, which will first contact the sloping edge of trigger disc 18 and tilt same, as shown in FIG. 7, which will move the tip 20 of the stem 19 from its rest position on operator 27 and thus permit the normally closed contacts of blades 23 and 24 to close, which will energize the restoring action of solenoid coil 11 at a time period dependent upon the major scoring circuit, not shown.

When the solenoid coil 11 is energized, the core 14 will be withdrawn downward against the restraining action of the spring 15 and move the rods 29 and the impact disc 28 downward and automatically restore the blades 23-24 to their normal open position. The sloping side of the impact disc will then force the ball B outward away from the bumper assembly and position the tip 20 and the trigger disc 18 to its normal idle position by virtue of spring 21, as shown in FIG. 8, and open the switch blades 23-24, which will permit the bumper assembly to assume its original position, as shown in FIG. 1.

It is also apparent that FIG. 1 is a dual assembly unit applied to the board 1, whereas the construction shown in FIG. 12 is a unit assembly which avoids the possible error of alignment of the placement of the screws 13.

It is also apparent that prior to the restoration of impact disc 28 to its upper idle position it is possible with a delayed electric action to prevent any further impact of a ball B against the trigger disc 18 for a particular type of game.

It is to be understood that certain modifications in construction are intended to come within the teachings and scope of the above specification.

Having described my invention, I claim:

1. A bumper means for a pinball game positioned through an opening in the board of said game and electrically responsive to the impact of a ball propelled against said bumper means from any direction on the upper surface of said board,

means forming a circular hollow pedestal secured to the upper surface of said board coaxial with the central axis of said opening and including a plurality of like pillars extending from the lower circular edge of said pedestal with holes through two opposite said pillars for fastening said pedestal by screw means on the upper surface of said board,

a cylindrical collar means having a predetermined inner diameter secured in said opening coaxial with said axis and having an integral planar spring seat extending inward a predetermined distance from the lower portion of said collar means,

a circular trigger disc of predetermined dimensions having a downward divergent upper marginal surface and including a central stem of predetermined length extending centrally downward from the under side thereof,

said disc having a clearance hole therethrough corresponding to each said pedestal pillar with a diameter larger than each pillar for permitting free tilting movement of said disc when positioned under said pedestal and in coaxial relation with said axis and against the lower side of said pedestal with predetermined clearance from the said upper surface of said board and the said stem thereof projecting downward through said collar coaxial with said axis,

a coil spring positioned around the upper portion of said stem with one end thereof positioned against

the under side of said disc and the opposite end thereof positioned against said spring seat in said collar for normally urging said disc and said stem into an idle position coaxial with said axis,

an electric switch means self urged into closed position secured to the under side of said board with a cylindrical operating member therefor normally positioned with the axis thereof substantially coaxial with said axis and in pressure contact with the end of said stem holding said switch means in said open position when said disc and said stem are in idle position,

said electric switch means adapted to close when the end of said stem is tilted from the upper end of said operator member,

an electric solenoid coil secured under said board by a bracket means with the core thereof coaxial with said axis,

restoring means secured to said core for engaging and moving said switch means from its closed to its open position and simultaneously permitting the said coil spring to move the end of the tilted stem to reseat to its position on the upper end of said operating member for holding said switch means in its idle open position whereby a ball rolling on the surface of said board and impinging upon the said marginal surface of said disc will tilt the latter and permit said switch means to move into closed position and whereby said switch means will initiate the energizing of said solenoid to restore all movable elements of said bumper means to their idle positions when connected to an electric control circuit.

2. The construction recited in claim 1 including a circular impact disc of uniform thickness having a concentric central hole loosely positioned around said pedestal and having a uniform upward divergent shape, a rod of predetermined dimensions secured at opposite sides of said disc with each rod parallel and

equi-distant from said axis within the said divergent shape,

each said rod projecting downward through clearance holes in said trigger disc and journalled for reciprocation in bushings secured through said board,

the lower ends of each said rod having a transverse member centrally secured to the upper portion of said core,

a restoring bracket secured to the lower end portions of said rods and positioned to engage said switch means and open same when said solenoid is energized and simultaneously move the impact disc to a predetermined downward position toward said trigger disc for preventing a ball from striking the latter when said solenoid is energized.

3. The construction recited in claim 1 wherein said pedestal and said trigger disc are molded from rigid plastic material.

4. The construction recited in claim 1 including a circular cap made from translucent rigid plastic material for predetermined configuration and data display, an electric light socket means secured within said pedestal for retaining a miniature lamp, said socket terminals projecting downward through a pair of oppositely positioned said pillars for connection to a source of electric energy.

5. The construction recited in claim 1 wherein the bumper means is constructed as a single unit assembly by providing a pair of circular mounting brackets of uniform thickness and having a mating central holes to receive said collar and retain same therein with a C washer and said brackets having a plurality of ears extending outward for receiving a plurality of mounting screws into the under side of said board, said switch means secured to an offset portion of the said solenoid bracket.

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