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J. E. LALLY ET AL

3,404,888

BALL GATING AND REPROJECTING MEANS

Filed Nov. 30, 1966

2 Sheets-Sheet 1

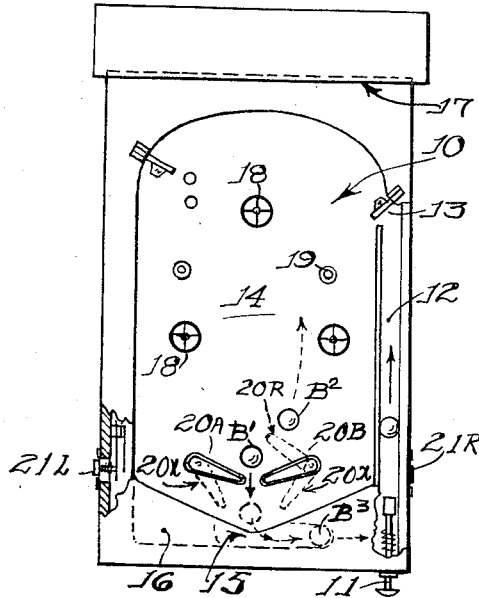


Fig. 1.

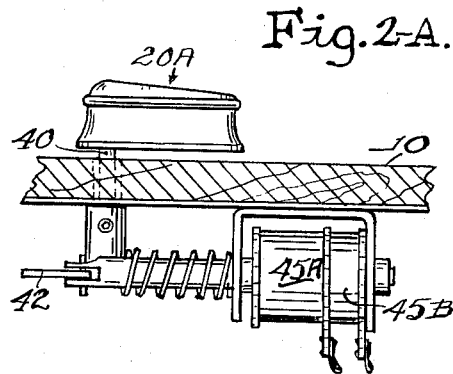


Fig. 2-A.

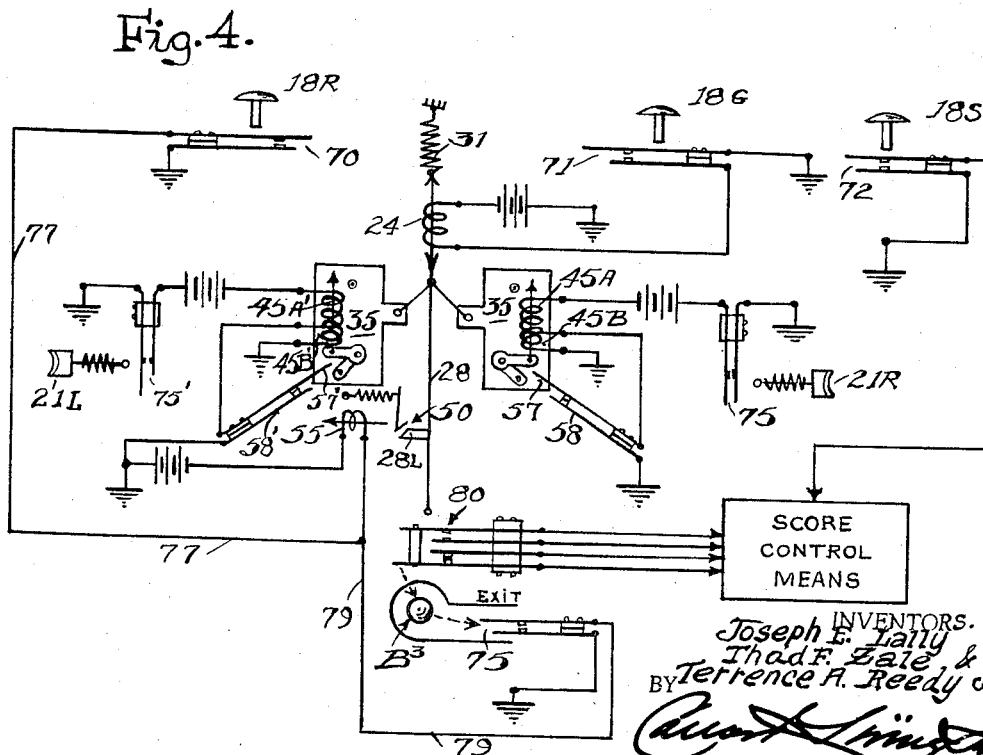


Fig. 4.

INVENTORS.
Joseph E. Lally
Thad F. Gale &
BY Terrence A. Reedy Jr.
ATTORNEY.

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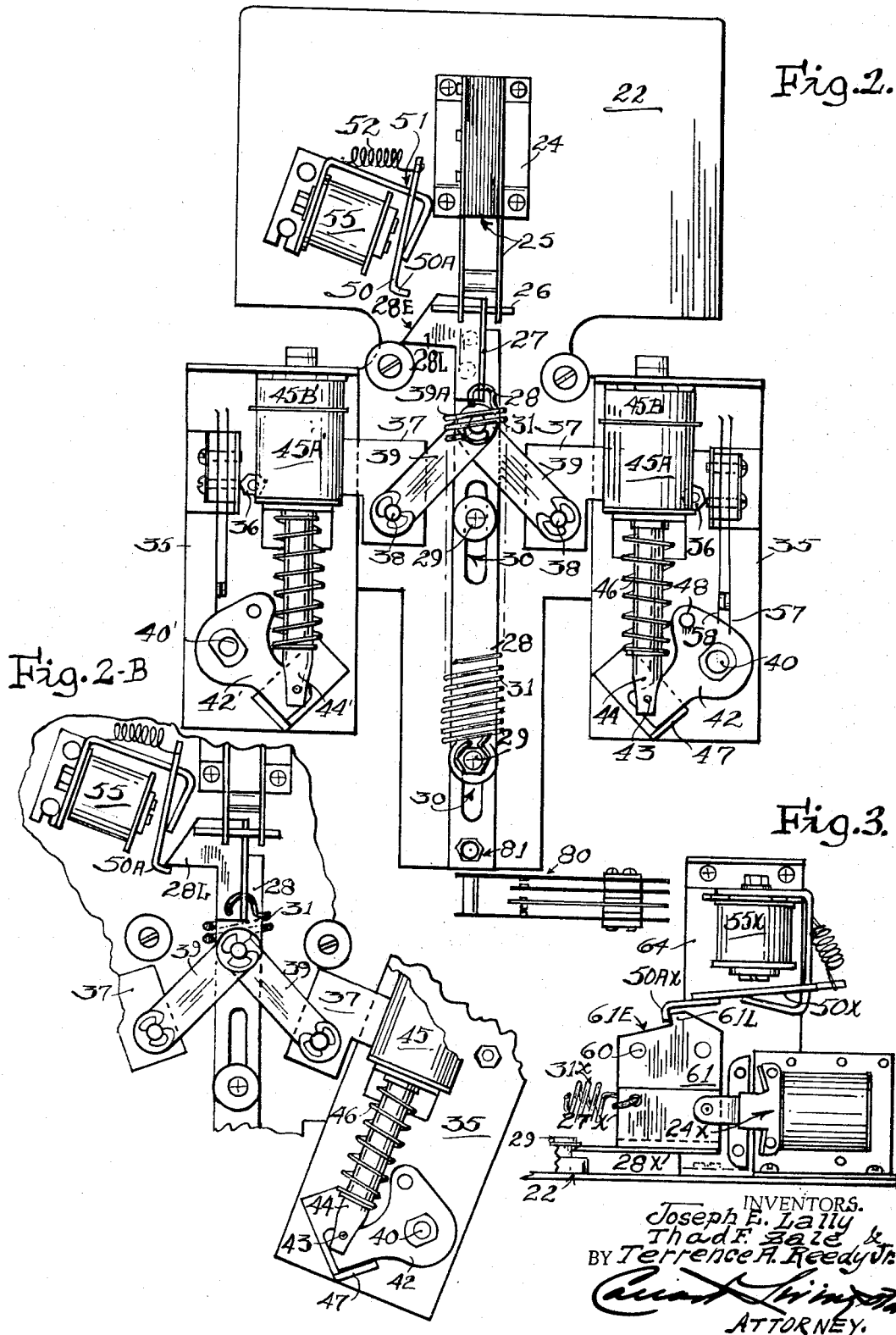
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2 Sheets-Sheet 2



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BALL GATING AND REPROJECTING MEANS
Joseph E. Lally, McHenry, Thad F. Zale, Chicago, and
Terrence A. Reedy, Jr., Skokie, Ill., assignors to Lion
Manufacturing Corporation, Chicago, Ill., a corpora-
tion of Illinois

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20 Claims. (Cl. 273-121)

ABSTRACT OF THE DISCLOSURE

A combination reprojecting ball bumper and gating mechanism is disclosed for use in ball-rolling games and is characterized by the disposition of at least two cantilever-type bumper arms each on a spindle which is disposed in a shiftable carrier, the carriers being in close proximity so that they can be moved to turn the bumpers toward and away from each other to define a ball gate which can be rapidly opened and closed by such movement of the carriers. The bumpers can also be pivoted individually about their spindles in a ball reprojecting action to drive the ball back away from the gate in both open and closed conditions thereof. Electromagnetic actuating mechanisms are selectively operable to effect movement of the carriers in gating action as well as pivotal reprojecting movement of the individual bumpers.

The following U.S. prior art patents and references therein cited are deemed relevant: 2,507,716 (Hughes); 2,520,283 (Koci); 2,642,290 (Moloney); and 3,298,691 (Berninger et al.).

The invention pertains to deflecting and reprojecting bumpers for use in ball-rolling games, and more particularly to the so-called cantilever type of bumper which is elongated and projects horizontally into space above the ball-rolling surface from a point of attachment at one of its ends to a post.

An example of such a bumper is found in U.S. Patent No. 3,298,691 to Berninger et al. wherein the post pivots about a vertical axis and an electromagnetic actuating means under the control of the player and/or ball-responsive scoring circuits, is effective to pivot the bumper in an abrupt reprojecting action (analogous to the swing of a baseball bat) for the purpose of striking the ball a blow which will send it on a new trajectory or diverting the ball from its expected trajectory whereby to change the scoring possibilities.

An example of another type of pivoted, overhead bumper having a T-head configuration, instead of the cantilever construction, is found in U.S. Patent No. 2,642,290 to Moloney, wherein a pair of elongated bumpers, each pivoted on a post at a point midway between its ends, rather than at one end as in the cantilever bumper, are jointly pivoted to bring adjacent ends closer together or farther apart to widen or constrict a passageway for a ball in the manner of a pair of swinging turnstiles, such pivotal opening and closing of the T-head gates being effected in step by electromagnetic means under the control of ball-operated scoring switches.

The present improvements relate to the swinging-gate type of arrangement of a cantilever bumper wherein each bumper of a pair is separately and selectively pivotable in a ball-projecting action, wherein the two bumpers are mounted on pivotable carriers for joint movement to and from passage-blocking relationship with respect to a ball-approach location or exit; wherein certain electromagnetic actuating means are selectively-operable by the player to effect the ball-reprojecting type of pivotal movement thereof; wherein other electro-mechanical means is provided to latch the combination against gating movements

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of the bumpers in one or the other of their angular positions; and wherein circuit means controlled by ball-operated scoring instrumentalities or other apparatus associated with the game is provided for automatically unlatching and releasing the bumper apparatus from the latched condition under certain conditions.

The foregoing features of novelty and utilitarian structure and function and others of more detailed character are more particularly described and claimed in the following specification in view of the annexed drawings wherein:

FIGURE 1 is a plan view of a ball-rolling game illustrative of one use of the novel bumper apparatus;

FIGURE 2 is a plan view of one of the bumper assemblies;

FIGURE 2A is a fragmentary side elevation of one of the bumpers with the playfield shown in section;

FIGURE 2B is a fragmentary change-position view based on FIGURE 2;

FIGURE 3 is a pivotal side elevation of a modified form of the latch means;

FIGURE 4 is a circuit diagram.

In the type of ball-rolling game illustrated in FIGURE 1, the player launches a ball onto the playing surface 10 by manipulation of a projecting plunger 11 to propel the ball into the projecting alley 12 past a no-return gate 13 and onto the upper and relatively elevated roll-down portion 14 of the playfield whence the ball can roll in a generally-downward direction under the combined effects of projecting forces and gravitational forces toward the lower end of the field at which there will be situated an exit 15 into which the spent balls ultimately find their way for return into play in each game cycle in the known manner.

Various types of ball bumper and scoring objectives 18, 19 will be arranged on the playfield to be struck by the balls in scoring action from time to time, some of the bumpers being adapted to actuate score-indicating lamps, registers and the like (not shown) in the backbox 17, in the known manner, while other bumpers may merely alter the course of a ball striking them.

The reprojecting and gating bumper means which is the object of the present disclosures may be located at one or more positions on the playfield, but will preferably guard the approach to the ball-return exit 15, indicated in dotted lines at the lower end of the playfield beneath an overlying panel portion 16 of the cabinet, the two pivotable cantilever bumpers 20A, 20B of each such unit being shown in full lines in a normally closed gating relationship to the approach to said exit, such that a ball advancing toward the same will be in a position either to be deflected more or less upwardly and back in the direction from which it came, or in a position to be struck a reprojecting blow by one or the other of the bumper arms if the same is actuated in its reprojecting function, as by the player pushing a corresponding one of the right- and left-hand control buttons 21R or 21L at the appertaining side of the cabinet.

As viewed in FIGURE 2, the bumper assembly includes a base plate 22 upon which is mounted an electromagnetic solenoid 24 having a reciprocable plunger 25 provided with a pin and slot connection 26 to an upstanding flange 27 constituting a latch piece affixed to an elongated drive lever 28 secured by headed pin means 29 in slots 30 so as to reciprocate codirectionally with said plunger.

A long tractile spring 31, broken away in part to expose the drive lever, has one of its ends anchored on the aforesaid flange and its opposite end anchored to one of the pins 29 which slidably guide the lever whereby to pull the lever, and hence the solenoid plunger outwardly of the solenoid bore, the plunger moving inwardly re-

sponsive to energization of the solenoid winding, as will appear hereafter.

Mounted at opposite sides of the drive lever on sub-carrier plates 35, pivoted as at 36 on the main base plate 22 (FIGURE 2) are two electromagnetic bumper re-projecting mechanisms of identical construction which, moreover, may be identical in essential respects to that disclosed in the aforementioned patent.

Each said sub-carrier includes an eccentric offset 37 pivotally connecting at 38 with a link 39 having another pivotal connection at 39A with the drive lever, such that movement of the latter under urgency by the solenoid will cause the two sub-carriers to pivot into the shifted angular position illustrated in FIGURE 2B.

Journalled on each sub-carrier plate is a bumper shaft 40 adapted to extend upwardly through the ball-rolling panel into supporting conjunction with the post of an appertaining one of the cantilever bumpers 20A or 20B, FIGURE 2A, such that when the subcarriers swing in gating action responsive to shifting of the drive lever 28, the two bumpers will be swung jointly and divergently to the dotted-line positions 20X shown in FIGURE 1, corresponding to the open-gate approach to the ball exit 15.

Either of the bumpers is pivotable independently about its own shaft axis 40 by the further mechanism shown in FIGURES 2, 2A, and 2B, which include a short bell crank 42 fast on the appertaining bumper shaft 40 to pivot therewith and having one of its ends pivotally connected at 43 to the end of the plunger 44 of a reprojecting solenoid normally urged outwardly of the bore of a solenoid winding 45 by spring 46 to the limit permitted by a stop flange 47 fixed on its subplate. An upstanding pin 48 on another leg of the crank is disposed to actuate a supervisory short-circuiting switch means by engaging switch blade 57 to move it into open condition relative to its companion blade 58 when the crank is pivoted to swing its bumper responsive to energization of the appertaining reprojecting coil 45, the operation of the companion bumper reprojecting mechanism 40', 42', 44', 45', etc., being identical. However, the two operating solenoids 45, 45' are arranged in a special control circuit for independently selective actuation, as will appear hereafter.

The solenoids 45 are preferably of the type disclosed in said Patent No. 3,298,691 and will have two windings 45A, 45B, in series, FIGURES 2 and 4, one of low resistance and the other of higher resistance, the latter being normally short-circuited by the appertaining supervisory switch means 57-48, so that initially the solenoid operates on the high-current (low resistance) coil for heavy reprojecting action, and when the supervisory switch opens to cut in the high resistance winding the bumper may be held (by switches 21R-L) indefinitely in actuated condition without danger of burn-out, as explained in said patent.

When the gating solenoid 24 is energized to shift the long drive lever 28, as aforesaid, the system will be latched up in a condition preferably wherein the bumpers are in the gate-open dotted-line condition 20X shown in FIGURE 1, this latched-up action being effected automatically by a releasable latch lever in the form of an armature 50 pivoted at 51 into a normal position by spring 52, to dispose an offset latching nose 50A on the armature in the path of a latching projection 28L preferably forming an offset integral part of the long lever 28 and having a cammed edge 28E serving to rock the armature out of its path in order that the latch projection can catch behind the armature offset 50A in the manner shown in FIGURE 2B, in which condition it will remain until the armature is pivoted to the dotted-line releasing position, as by energization of a releasing electromagnet 55 by circuit means to be described, in which circumstance the long traction spring 31 will restore the drive lever to the normal position shown in FIGURE 2.

A modified form of the latch means is depicted in

FIGURE 3, wherein the flange 27X has affixed thereto by means such as rivets 60, a latch plate 61 formed of a material having minimal frictional qualities such as nylon, this plate lying in a vertical plane and having a cam edge 61E terminating in a latching nose or detent 61L adapted to coact with the latching offset 50AX on the latch release armature 50X of an identical electromagnetic latching structure such as depicted in FIGURES 2 and 2B, including a releasing coil 55X, the electromagnetic latching means in this embodiment, however, being mounted on an upstanding bracket means 64 supported on the base plate 22, as at 65. The long drive lever 28X is identical in other respects to that described in view of FIGURE 2, and is shifted by action of the same electromagnetic solenoid means 24X and spring 31X.

In addition to its action in gating or controlling ball movements into the exit 15 (FIGURE 1) the device has ball-reprojecting and score-control functions exemplified in view of FIGURE 4 wherein some of the ball objectives or bumpers 18R, 18G, 18S dispersed on the playfield actuate scoring switches 70, 71, 72 connected in various circuits to control the shifting of the gating bumpers to and from gating positions, as well as the actuation of the latch means to release the bumpers from blocking position, and certain score-control means.

For example, a ball striking one of the bumpers 18G closes the appertaining switch 71 and energizes the drive-lever solenoid 24 via conductor 73 to shift the drive lever 28 and pivot the bumper carriers 35 to a position wherein the two reprojecting gate bumpers 20A, 20B (FIGURE 1) will be in the full-line obstructing or gate-closing relationship to the exit 15 shown in FIGURE 1, in which condition they will be latched by the latching armature means 50. In this condition, the exit 15 and return runway beneath panel 16 will be closed off, and a ball approaching at position B¹ (FIGURE 1) may be reprojected in some direction, for example that of the ball B², by depressing the right-hand control switch button 21R to close the appertaining switch 75 and energize the corresponding bumper solenoid 45 thereby imparting a rapid angular displacement to the corresponding bumper 20B moving it in reprojecting action hard in the direction of the dotted-line position 20R, causing it to strike a ball such as B¹, assuming that the ball is in the range of this bumper. The same reprojecting action may be had by actuating the reprojecting control button 21L if the ball should be within range of the left-hand bumper 20A.

Assuming that another played ball (which might be the aforesaid reprojected ball) strikes the bumper 18R, the ball or bumper switch 70 would close to energize the latch-release coil 55 via conductor 77, thereby freeing the long drive lever for return to normal position under urgency of the traction spring 31 to open the gate and the passage to the ball exit 15 again.

The bumpers 20A, 20B may also be caused to assume the opengate position by another scoring possibility, such for example as the action of a returning or exiting ball B³ in closing the ball-return switch 78 and thereby energizing the latch release coil 55 via conductor 79.

Cooperable with a part of the gate-bumper actuating means, for instance the long drive lever 28, is a supervisory score switch means 80 (FIGURE 2 also) disposed in alignment with an actuating pin 81 on the end of this lever with certain of the contacts of this switch opening and closing correspondingly with reciprocatory movement of this lever to control desired scoring circuits to the "Score Control Means" indicated schematically, it being apparent that a variety of desired circuit arrangements may be had dependently upon the movements of the gating mechanism as determined, for example, by the operations of the lever 28, the latter in turn being moved by the electromagnetic means 24 responsive to ball-actuated scoring means 18, 19, etc., so that a substantial choice of game features and scoring possibilities is presented in

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adapting the device to use in connection with ball-rolling amusement apparatus.

It is to be observed that in its reprojecting functions, the novel reprojecting and gating bumper means is capable of reprojecting the balls in either closed or open gating condition under the control of player-actuated switches; and these conditions in turn may be controlled by ball movements in scoring hits on various scoring or bumper switches as an incident to the over-all play of the game. Moreover, the ultimate scoring resulting from all possible ball movements can likewise be affected by the gating mechanism as well as directly by a target means such as the bumper 18S and its ball switch means 72, connecting directly into the "Score Control Means."

The form of latch means disclosed in FIGURES 2 and 2B has the advantage of lying flat and requiring less clearance space than the form of FIGURE 3, while the latter has an advantage when disposed in a vertical plane of being less critical for latching and releasing adjustment with respect to sidewise looseness of the drive-lever 28.

We claim:

1. In a ball-rolling game, ball-reprojecting and gating mechanism utilizing reprojecting bumpers of the pivotable cantilever-arm type provided with supportive spindle means and electromagnetic actuating means interconnecting therewith and operable to swing the arm in reprojecting action from a normal position to an advanced off-normal position, wherein there are at least two of said bumpers each mounted on a pivotable carrier with respect to which each bumper spindle means can move in reprojecting action and said carriers being linked with drive means operable to pivot the carriers simultaneously from a normal position to a gating position in which the bumpers are respectively disposed in a relatively converged or diverged condition provided they are respectively disposed in their normal reprojecting positions, whereby to bar the passage of a ball therebetween in the converged condition thereof and to open a passage therebetween for a ball in the diverged condition thereof; and further electromagnetic means having operative interconnection with said carrier drive means and operative to actuate said drive means for pivoting the carriers from and to the normal position aforesaid, said first-named electromagnetic means being selectively and individually operable.

2. Mechanism according to claim 1 wherein the drive means comprises a reciprocable member and crank means operable thereby and linking with each carrier, together with means drivingly interconnecting the reciprocable member with said further electromagnetic means.

3. Mechanism according to claim 2 wherein said further electromagnetic means comprises a solenoid having a plunger aligned for reciprocation co-directionally with the reciprocatory movement of said reciprocable member, and spring means urging said member to said normal position wherein said plunger is withdrawn from the solenoid in condition to be attracted thereby.

4. Mechanism according to claim 1 wherein there is provided a releasable latching means cooperable with said drive means to latch the mechanism automatically in one of its two operative conditions; together with means operable to release the latching means.

5. Mechanism according to claim 4 wherein said latching means is a magnetically attractable latch member spring-urged for movement from a released condition to a latching condition, and said release means comprises an electromagnet energizable to attract said latch member to said released condition.

6. Ball-reprojecting and gating bumper apparatus for ball-rolling games which is of the type having a pair of horizontally-extensive bumper arms projecting into space above a ball-rolling surface and respectively pivoted for movement about individual pivotal reprojecting axes to converge or separate end portions thereof to permit or obstruct passage of a ball therebetween, wherein the improvement consists in each bumper being mounted on a

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carrier which is itself pivoted to swing about a gating axis different from the said pivotal reprojecting axis of the appertaining bumper arm; wherein each carrier includes arm-pivoting means for briskly moving the appertaining bumper arm in ball-reprojecting action; wherein there is provided a driving mechanism interconnecting with said carriers and operable to move the same to and from first and second gating positions disposing the carriers to positions in which the bumper arms are in relatively separated or converged relationship for passing or obstructing passage of a ball therebetween as aforesaid; wherein there is provided electromagnetic actuating and associated control means selectively operable to actuate said pivoting means to effect reprojecting action, and to actuate said driving mechanism to effect movement of the carriers to and from the gating positions thereof as aforesaid, said arm pivoting means being selectively and individually operable.

7. Apparatus according to claim 6 wherein said arms are respectively affixed near one of their ends to a spindle containing the pivotal reprojecting axis and in a manner to extend into space above the ball-rolling surface as aforesaid in cantilever fashion, with respective opposite end portions disposed for movement in the relatively separating and converging movements set forth.

8. Apparatus according to claim 6 wherein said driving mechanism includes a drive lever and means drivingly interconnecting the same with said carriers, together with first means yieldingly urging a part of the mechanism to a position disposing the carriers in a normal position with the bumper arms disposed in a first gating condition; and second means drivingly interconnecting with said mechanism and operable to effect a shifting of said lever in a different direction to pivot the carriers from normal position and dispose the bumper arms in a second gating condition.

9. Apparatus according to claim 6 wherein said driving mechanism has first and second operating conditions respectively moving the carriers to a normal and off-normal position in one of which the bumper arms are disposed in a first gating relationship, and in the other of which the bumper arms are disposed in a second and different gating relationship, together with releasable latch means acting automatically to latch the carriers in one of said normal or off-normal positions.

10. Apparatus according to claim 6 wherein said driving mechanism includes first means yieldingly acting to cause the mechanism to move the carriers into a normal position with said bumper arms respectively disposed in one particular gating condition; and said driving mechanism further includes second means operable to shift the carriers from said normal position to dispose the bumper arms in a different gating condition; together with releasable latch means automatically cooperable with said mechanism to cause the carriers to stand in the shifted position; and third means for releasing said latch means whereby to cause said first means to return the carriers to normal position.

11. Apparatus according to claim 10 wherein said second and third means are electrically operated and said control means includes switch means connected in circuit therewith and operable to actuate the same separately.

12. Apparatus according to claim 11 wherein said switch means is operable by a ball at some time moving over said ball-rolling surface.

13. Apparatus according to claim 11 wherein the ball-rolling game includes ball-operated switches and circuit means controlled thereby for actuating the first means responsive to ball-operation of at least one certain one of said switches, and said second means is actuated by at least one different one of said switches.

14. Apparatus according to claim 11 wherein said reprojecting-action arm-pivoting means is electrically actuated and said control means further includes reprojecting

switch means connected for operation to actuate either bumper arm.

15. Apparatus according to claim 14 wherein said re-projection switch means is manually operated.

16. Apparatus according to claim 15 wherein the ball-rolling game includes ball-operated switches and circuit means controlled thereby for actuating the first means responsive to ball-operation of at least one certain one of said ball-operated switches, and said second means is actuated by at least one different one of said ball-operated switches.

17. In a ball-rolling game having a playfield over which a ball is rolled relative to predetermined objectives including control instrumentalities for actuating score control means, a combination ball reprojecting and gating mechanism comprising: at least two pivotally acting ball reprojectors, shiftable means for each reprojector providing a pivotal mounting therefor disposing the reprojectors in said playfield for engagement by a rolling ball thereon and shiftable to dispose the reprojectors in relatively converged closing and diverged opening gating proximity to prevent or permit passage of a ball therebetween, each reprojector being pivotable individually relative to the appertaining shiftable means in ball reprojecting action independently of its gating position; electromagnetic pivoting mechanism for each reprojector and operable to move the same in ball-striking reprojecting action; shifting means for effecting gating movements of the shiftable means and including a movable drive member and means drivingly connecting the same with said shiftable means for effecting shifting thereof responsive to driving movement of the drive member; further electromagnetic mechanism connected with said drive member and operable to impart driving movements thereto; and circuit means including switch means operable to connect and disconnect operating power selectively to said electromagnetic mechanism to actuate either reprojector in reprojecting action or effect the joint shifting and gating action thereof.

18. Apparatus according to claim 17 wherein said projecting and gating mechanism is situated on said playfield relative to one of said objectives constituting an exit for a rolling ball from said playfield, and said reprojectors in the opening and closing gating positions thereof prevent or permit passage of a ball therebetween to said exit, the said shifting means acting to produce the said opening shifting of said reprojectors in a direction generally to-

ward said exit, and the electromagnetic pivoting mechanism acting to produce reprojecting movement of the reprojectors in a direction generally away from said exit thereby tending to direct a reprojected ball back into play on said playfield.

19. Apparatus according to claim 17 further including automatic latching means cooperable with said shifting means to latch a part thereof for the purpose of preventing movement of said reprojectors from one of said opening or closing gating conditions thereof; together with electromagnetic release means cooperable with said latching means and operative to release the latching action thereof to permit movement of the reprojectors from said one to the other of said gating conditions.

20. In a ball-rolling game, the combination with a ball field of at least two shiftable spindle supports and spindle means rotatable therein; an elongated reprojecting bumper arm carried by each spindle in radial projection in said field to strike a ball within its range responsive to pivotal reprojecting motion of the appertaining spindle; the said supports being in such proximity as to dispose said arms as a gate means for relative divergent and convergent gating motion to open and close a path therebetween for a ball approaching the gate from a predetermined general direction; first actuating means for shifting said spindle supports in unison and in directions to effect relative gating motion of the arms as aforesaid so as to open in a direction away from said general direction of approach; and second actuating means selectively operable to effect pivotal reprojecting motion of either spindle means and the appertaining bumper arm with the arm moving from a normal position of rest to impart a reprojecting blow to a ball which is in a direction opposing and away from said general direction of approach of a ball tending to approach the gates as aforesaid.

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RICHARD C. PINKHAM, *Primary Examiner.*

THOMAS ZACK, *Assistant Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,404,888

October 8, 1968

Joseph E. Lally et al.

It is certified that error appears in the above identified
patent and that said Letters Patent are hereby corrected as
shown below:

In the drawings, Figure 3, the dotted line screw (shown at the right of numeral 28x) has been designated by numeral -- 65 --; Figure 4, the conductor which extends between switch 71 and coil 24 has been designated by numeral -- 73 --; Figure 4, the numeral "75" (which appears to the right of B3 and above 79) has been changed to -- 78 --. In the heading to the printed specification, lines 4 and 5, "Lion Manufacutring Corpora-
tion, Chicago, Ill., a corporation of Illinois" should read -- Bally Manufacturing Corporation, Chicago, Ill., a corporation of Delaware --. Column 3, line 49, "switch means 57-48" should read -- switch means 57-58 --. Column 7, lines 39 and 40, "said projecting" should read -- said reprojecting --.

Signed and sealed this 5th day of May 1970.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents