The present disclosures relate to ball-rolling games and more particularly to ball-retaining and releasing shutters for such games, and to improvements in a selective shutter structure characterized mainly in that the usual shutter panel is divided into a plurality of independently shiftable sections, any or all of which may be moved from ball-retaining to ball-releasing position.

Another feature of the novel shutter means is the provision of a shifting or shuffling motor and stroke-arm means reciprocated thereby as a drive means common to all shutter sections, together with electromagnetically controlled latching or coupling means by which desired sections may be locked out from shifting from ball-retaining position by the driving stroke-means.

It is a further particular object in this connection to provide a simple latching device in the form of an electromagnet fixed on a shutter section and having an armature moveable into and out of latching engagement with a simple keeper or cleat on the stroke arm to thereby interconnect the shutter section therewith.

A further feature is the provision of electromagnet latch means to lock out other shutter sections and prevent their being moved from ball-releasing position.

A further feature is the arrangement of the novel multiple shutter structure with electromagnetically controlled lock-out means acting to prevent movement of the sections out of ball-retaining position so that balls in certain score pockets can be held over, and to prevent still other sections from moving out of ball-releasing position so that other score pockets will in effect be temporarily eliminated as scoring possibilities, together with selective circuit means giving the player control of certain shutter sections, while other sections are automatically controlled by the ball-switch scoring means, whereby to afford the player a greatly expanded range of scoring arrangements or possibilities and enhance the entertaining aspects of such games.

Additional objects and aspects of novelty will appear as the following specification proceeds in view of the annexed drawings in which:

Fig. 1 is a bottom plan view of a sectionalized shutter panel and selective electromagnetic control means therefor;

Fig. 2 is another bottom plan view of the sectionalized shutter panel showing the several shutter sections in selected positions of operation;

Fig. 3 is a cross-section taken along the irregular line 3—3 of Fig. 2;

Fig. 4 is a fragmentary, vertical sectional detail of one of the selectively-operable electromagnetic shutter control devices with parts shown in elevation, as seen in the direction of lines 4—4 of Fig. 2;

Fig. 5 is a circuit diagram, with structural features of the shutter control means shown schematically;

Fig. 6 is a fragmentary bottom plan view of one shutter section provided with a modified lockout mechanism;

Fig. 7 is a fragmentary vertical sectional detail to enlarged scale, and with parts shown in elevation, of the modified lockout mechanism of Fig. 6.

Referring to Fig. 1, four shutter panels 11, 12, 13, and 14 are shown mounted to slide upon the underside of a ball-rolling board 10 of the conventional type in which there are a plurality of ball exit openings or out-pockets 15 shown in dotted lines in Fig. 1, and in both dotted and full lines in Fig. 2.

The individual shutter panels 11 and 12 are slidable lengthwise (i.e., up and down in Figs. 1 and 2) of the ball board 10, being supportably guided for this purpose by brackets 16; whereas the remaining panels 13 and 14 are shiftable laterally (i.e., left to right) on the board in brackets 16A.

Normalizing springs 17 urge the two longitudinally shiftable panels into a normal position in which the respective exit openings 11X and 12X thereof are out of register with the ball pockets or holes 15 in the play board, in which condition of course any pocketed balls in holes 15 would be held until such time as the shutter plate might be shifted to the releasing position to bring the holes 11X into register with the board holes and thereby enable the pocketed balls to drop through for re-use in the game in the well-known manner.

Similarly, the laterally-shiftable shutter panels 13 and 14 are provided with normalizing springs 18 pushing them sidewise into a normal position in which their respective exit holes 13X and 14X are out of register with the associated board pockets or holes 15.

Means for shuffling or shifting the shutter panels to effect release of pocketed balls includes a geared-down electric motor 29 (Fig. 1) driving a crank means 21, which in turn reciprocates a short drive arm 22 connecting with a common drive bar 23 to which are attached a pair of long stroke arms 24, 24A, each supported to reciprocate in slide brackets 26 on the board 10.

Electromechanical means for selectively coupling and uncoupling certain of the shutter panels (e.g. 11 and 12) with the drive means includes (Fig. 4) an armature 28 adapted to be attracted by an electromagnet 29 from and out of a normal coupling position into which it is urged by spring 30 (Fig. 4).

One of the coupling armatures 28 or 28A, as in Fig. 2, and its associated electromagnet 29 or 29A is carried on each of the shutter panels 11 and 12, and each armature is situated for movement into and out of normal coupling position between appertaining coupling members or means consisting of a pair of short stroke arms 32, 32A, respectively, mounted on the adjacent stroke rod 24 or 24A, springs 30 acting in each instance to urge the appertaining armature 28, 28A into its normal coupling position between the corresponding pair of angle cleats 31, 32A, by means of which movement of the stroke arms 24, 24A transmits an effort to the armature pieces and hence to their appertaining shutter sections 11, 12, whereby the latter can be reciprocated jointly with said stroke arms.

Either of the shutter members 11 or 12 may be selectively uncoupled, however, by energization of one or the other of the electromagnets 29, 29A to attract the corresponding armature 28, 28A from its normal coupling position and withdraw the same fully from between the coupling cleats 31 or 32A, as the case may be, so that no displacing or shifting effort can be imparted to such panel or panels, and they are locked out against ball-releasing action.

Means for shifting the shutter plates 13 and 14 includes the cam devices 35, 38A (Figs. 1 and 2) carried respectively on stroke arms 24, 24A, and each adapted to ride against a corresponding pin 39, 39A fixed on the appertaining shutter plate 13 or 14 in such manner as to be cammed laterally of the board 10 responsive to the up-
ward component of the cycle of the stroke arms, the normal springs 18 acting to restore the laterally shiftable panels during the remainder of the reciprocatory travel of the stroke arms.

Thus, in the normal or non-energized condition of the electromagnetic selective shutter-control means all of the panels 11, 12, 13, and 14 can be caused to shift jointly responsive to a resetting revolution of motor crank means either of the panels 11 or 12 may be eliminated from the group action responsive to energization of either or both of the electromagnets 29, 29A.

A further feature of selective operation resides in the fact that either or both of the shutter sections 13 and 14 may be eliminated from the group action responsive to ball-releasing action in the manner and by the means now to be described.

As in Figs. 1 and 2, there is provided for each of the shutter panels 13, 14, a releasable holding means in the form of a latch member 40 or 40A pivoted on board 10 and operable to latch with pin means 41, 41A respectively carried on the panels 13 and 14.

Associated with each lock dog 40, 40A is an electromagnetic releasing means in the form of a solenoid 42, 42A having the usual plunger means 43 or 43A urged by the solenoid 42, 42A against the spring therein (not shown), each plunger in turn being linked by a rod member 44 or 44A pivotally connecting to a corresponding one of the latching devices or dogs 40, 40A, so as to dispose the latter respectively in the normal positions shown in Fig. 1 for latching engagement with the corresponding latch pin 41 or 41A. In the event the appertaining shutter panel shifts to cause either pin to engage the camming nose of the associated dog and become latching engaged or hooked with the latter, as illustrated in Fig. 2, wherein the dog 40 is shown locked up with its latch pin 41, it being convenient to observe at this juncture that the other latch dog 40A may be pivoted out of latching position relative to its pin 41A.

Fig. 1 shows the entire shutter panel and selective shutter control means in a normal condition in which all shutter ball holes 11X, 12X, 13X, 14X are out of register with the corresponding playfield pockets or holes 15 in board 10, as could be considered the situation at the commencement of a new round of play, following a resetting operation which would result from actuation of the "starting" or "free play" switch means, for example, the shutter-ball manipulator 23 of the motor shutter control mechanism is shown in mid-cycle with the stroke arms 24, 24A displaced upwardly and resting at the end of the forward half of their reciprocatory shuffling stroke.

In this mid-stroke condition of the stroke arm 24, 24A, it is to be assumed that the selector electromagnet 29 is not energized, while the selector electromagnet 29A is energized, and the selector solenoid 42 is not energized, while the other solenoid 42A is to be considered energized, in consequence of which the following selective conditions of the several shutter panels would exist, as depicted in Fig. 2: shutter plate 11 is in fully shifted ball-releasing condition because its latching armature 28 remains in coupling relation with the coupling cleats 32; shutter plate 12 remains unmoved in normal ball-retaining position, because its associated selective-coupling electromagnet 29A is assumed to be energized and therefore attracts the armature 28A out of coupling relation with the stroke-arm coupling cleats 32A, having thereby temporarily withdrawn the driving interconnection between stroke arm 24A and shutter panel 12; further, the shutter 13 has been fully shifted to the right and become latched in that condition as a result of interengagement of latch members 40, 41; the remaining shutter panel 14 likewise having been fully shifted (toward the left) but not being latched in this condition because the solenoid 42A is assumed to be in energized condition, as a result of which the latch dog 40A is disposed in a non-latching position.

Accordingly, if it now be assumed that the crank 21 completes its cycle and returns the stroke arms 24, 24A through the last half of their reciprocatory stroke back to the normal condition of Fig. 1, while the selective electromagnetic devices 29A and 42A continue to be regarded as energized, in accordance with the conditions described, and as shown in Fig. 2, then the shutter panel 11 will return to normal position (downwardly) as will panel 14 (toward the right); but panel 13 will be held by latch means 40—41 in the fully displaced position shown in Fig. 2, and this condition will persist until such time as the solenoid 42 is energized to cause latch dog 40 to disengage latch pin 41 and free the panels 13 for movement by its spring means 18, toward the left, back to normal position.

It will be apparent that the electromagnetic devices 29, 29A, 42, 42A may be energized selectively in different combinations to effect correspondingly different ball-releasing and ball-retaining operations, it being pointed out in the latter connection that either or both of the shutter panels 13 or 14, for example, could be held latched indefinitely in ball-releasing condition, whereby, in effect, selectively eliminating the associated ball pockets 18 by play, since no balls could become trapped in these pockets. Moreover, either or both of the shutter panels 11 and 12 could be prevented indefinitely from shifting so long as the appertaining electromagnetic coupling means were held energized and the corresponding ball pockets 15, in which balls might have become lodged, would be rendered effectively out of play so long as the locked-out panels could not be shifted.

In Fig. 5 there is shown schematically a control circuit for the novel shutter mechanism in accordance with which the selective actuation of the shutter sections is partly under direct control of the player and partly under his indirect control as a function of scoring in playing the game and the actuation of certain ball switches, whereby certain shutters are locked out or uncoupled and prevented from shifting, while others may be held in locked-out condition and hence, in effect, be uncoupled or decoupled.

As is customary in games of the class described, the ball-return means is actuated at the start of each new game cycle responsive to operation of the usual starting or free-play switch means which results, among other things, in closure of a reset switch 50 by the usual master in the control circuit means (Fig. 5), thereby energizing the reset or shuffle motor 20 for the duration of one duty cycle to complete the reciprocation of the drive rods 24, 24A.

In prior games, such an energization of the shuffle or ball-return motor would ordinarily result in the release of all trapped balls; but, in accordance with the present disclosures, the player is given the option of deliberately holding any balls which may have become lodged in out-pockets associated with one of the shutter sections 11 or 12, for example.

Optional holding of balls, as aforesaid, is effected by closure of selector switch 1 to close its contacts 52, thereby completing an operating circuit for the coil of the shutter-coupling electromagnet 29X from the power source 53 (shown schematically as a battery), normally closed master breaker-switch contacts 54, conductors 55, 56 to the coil 29X, conductor 57, selector switch contacts 52 closed, to the return circuit indicated as ground, to which one terminal of the power source or battery 53 is connected by conductor 59.

Energization of the selector coil 29X, as aforesaid, attracts the coupling armature 28X out of coupling relation with cleats 32X on the drive rod 24, by reason of which the shutter section 11 must remain at rest, and any balls lodged in any of the appertaining ball pockets
will not be freed, but will be held over for the ensuing game cycle or round of play.

Another optional selecting operation available to the player is to release a locked-out one of the shutter sections by actuation of the selector switch II to close its contacts 62, thereby completing a circuit from power source 53, normally closed breaker switch contact 54, conductor 55, the coil of solenoid 42X, conductor 63, selector contacts 62, closed, to the common return circuit or ground. A result of energization of solenoid coil 42X, the latch 40X associated with the shutter section 13 will be withdrawn from pin 41X so that the shutter panel is freed for return to normal blocking position under urging of its spring means 18 (Figs. 1 and 2).

The control circuit also affords certain automatically selective actuations of the shutter means as a result of lodging balls in certain ball pockets. For example, assume that a ball has been lodged in a pocket associated with shutter panel 11 to close the appertaining ball switch contacts 66, a circuit will thereby be completed from battery 53, closed breaker contacts 54, conductors 55, 55A, relay coil 68, to relay contact 67, conductor 69, said ball switch contacts 66, closed, to the return circuit or ground, thereby causing relay coil 68 to pull up its contacts, so that grounded contact 70 closes with its contact 71 to operate an operating circuit for the coil of the coupling of electromagnet 29AX via conductors 72 and 73, to the same power conductor circuit 55, 54, 53 just described.

In consequence of the aforesaid energization of the score relay coil 68, the energization of electromagnet 29AX attracts the coupling armature 28AX and prevents reciprocation of shutter panel 12, by the stroke arm 25, so that said panel 12 is effectively locked-out of the reset operation. The relay coil 68 establishes its own holding circuit at contacts 67, 67A, and will remain energized until the breaker switch contacts 54 are opened under control of the master game control means in the next game cycle, even though shutter panel 11 might be shuffling in the meanwhile to release the ball responsible for actuating ball switch 66.

Another automatic selective shutter panel operation is controlled by ball switch contacts 76 on shutter section 13, closure of which completes an operating circuit from power source 53, via breaker contact 54, closed, conductors 55, 55A, relay coil 78, relay contact 77, conductor 79, said ball switch contacts 76, closed, to the common ground return.

Energization of relay coil 78 locks-in its own holding circuit at contacts 77, 77A, and closes its contacts 80, 81 to energize the release solenoid coil 42AX via conductor 82, and power circuit 55, 54, 53, thus disengaging latch member 40AX from its pin 41AX to free the shutter panel 14 for return to normal position in the event it should have been locked-out in open or ball-releasing condition at the time relay means 78 pulls in, as aforesaid.

In Fig. 6 there is shown a modified lockout means by which a shutter section 13Y can be selectively prevented from leaving either the ball-releasing or the ball-releasing position, this means being in the form of a solenoid 90 which with the striker arm 24Y and the cam or drive member 38Y, the inclined edge of which rides against the reduced upper end portion 91 of the solenoid plunger when the latter is in normally elevated condition, as by the action of the internal spring 92 (Fig. 7).

When the shutter 13Y has been shifted fully to the ball-releasing position (e. g. analogously to that of panel 13 in Fig. 2) the reduced end 91 of the solenoid plunger will cam into the lockout hole 96 in an overlying bracket 95 on ball board 10, provided of course that the solenoid is not at this instant energized.

The normal, elevated or driving position of the driven member or solenoid end part 91, is shown in dotted lines in Fig. 7, from which it will be apparent that it will shut the driving or cam member 38Y when the striking stroke of arm 24Y begins; but should solenoid 90 be energized at this instant, the shutter would remain at rest in the ball-retaining position.

Assuming, however, that the solenoid is not energized and its plunger remains normally elevated, as in dotted lines, Fig. 7, then at the end of the shifting stroke, the plunger will cam down against the chamfered lead edge 97 of the bracket, and the plunger end 91 will enter the hole 96 and hold the shutter locked in the ball-releasing condition until such time as the solenoid 90 is energized, for example by operation of a switch like switch 62 or relay switch means 89—91 if the solenoid 90 were connected respectively in place of the solenoids 42X or 42AX in the circuit of Fig. 5.

I claim:

1. In a ball-releasing and releasing shutter mechanism for ball-rolling games played with a plurality of balls and having a plurality of score pockets adapted to be closed and opened by a movable shutter, shutter-panel means comprising: a shutter mechanism consisting of a plurality of independently movable shutter sections each shiftable back and forth from ball-retaining to ball-releasing positions; a motor and drive means extended therefrom for driving interconnection and disconnection with any of said sections; electromechanical control means operatively associated with each of said sections and with said drive means for selectively controlling shifting movements of certain ones of said sections in individual and joint action from ball-retaining to ball-releasing position, and vice versa for certain other sections; together with circuit and switch means connected for operation to selectively actuate the aforesaid control means to effect shifting movement of all or less than all of said sections.

2. Apparatus according to claim 1 in which said electromechanical means includes an electromagnetic lock-out device for each said section and connected for actuation by the switch means aforesaid for operation to prevent shifting of certain of said sections from ball-retaining to ball-releasing position, and to prevent shifting of certain other sections from ball-releasing to ball-retaining position.

3. In a ball-releasing and releasing shutter panel mechanism for ball-rolling games of the type utilizing a plurality of balls which may be played into any of a plurality of scoring holes closed and opened by a shutter panel, improvements comprising: a shutter panel divided into a plurality of sections and means for individual shifting movement from ball-retaining to ball-releasing positions; electromechanical shifting mechanism for moving said sections back and forth from ball-retaining to ball-releasing position; interdrive means for each said section normally in an effective position to provide a driving interconnection between said shifting mechanism and the respective sections; and electromechanical control means for the interdrive means of each said section operable to lock out a part of the interdrive means of certain sections from effective position and hold the same against movement from ball-retaining to ball-releasing position and further operable as aforesaid for locking out certain other sections against movement from ball-retaining to ball-retaining position; together with circuit means for actuating said shifting mechanism and including switch means connected with each said electromechanical control means for actuating the means for efficiently shifting between said retaining and releasing positions; shifting
means including a drive member movable in a path close to each of said sections for shifting the same relative to said positions; and selective lock-out mechanism for said sections and comprising driven lock-out means carried by each said section; driving lock-out means for each said driven lock-out means, the said driving lock-out means being movable with said drive member; and electromagnetic means for said sections and conditioned normally to dispose said driven lock-out means for driving relations with the appertaining driving lock-out means whereby to latch said sections with said drive member for shifting movement thereby; and circuit means including a control switch connected with each said electromagnetic means for selectively energizing and deenergizing certain ones of the latter to effect movement of corresponding driven lock-out means into and out of driving relation with the corresponding driving lock-out means.

5. In a ball-retaining and releasing shutter structure for ball-rolling games, a shutter divided into a plurality of independently shiftable sections to move between ball-retaining and releasing positions; lock-out means for selectively controlling shifting movements of said sections and including complementary pairs of latching members for each section, one member of each said pair being carried by the appertaining section and the remaining member of each pair being mounted in a position at one side of the section position adjacent to the section with latching means for each pair of latch members including spring means normally urging one of the complementary members into position for latching engagement with the other member of said pair, and electromagnetic means for each said pair energizable to move one of the complementary latch members out of latching relation with the other drive means for shifting said sections; said latch means acting in latching operation to maintain the corresponding sections in a predetermined driving relationship to said drive means.

6. In a ball-rolling game, ball-retaining and releasing shutter means comprising a multiple-section shutter panel having each section independently shiftable into and out of ball-retaining and releasing positions; drive means common to all sections for shifting the same; interdrive means for individually coupling each section with said drive means for shifting displacement by the latter; a common electromagnet for each section; a movement-controlling coupling device actuated by each electromagnets; complementary coupling means operatively engaged by each coupling device in a certain position of each section relative to one or more said ball-retaining or releasing positions, to control the movement of the appertaining section from such position.

7. In a ball-rolling game of the type having a ball-rolling board with ball-receiving holes therethrough and a shutter slidable therebelow to block or open the holes to retain balls pocketed therein and free pocketed balls therefrom, improvements as follows, namely: selective shutter means including a plurality of small shutter sections mounted beneath said board and each independently slidable to block or open certain ball pocketing holes; a shuttle motor and at least one stroke arm reciprocated thereby beneath said sections; a drive member carried on the stroke arm for each shutter section; a driven member carried on each shutter section for cooperation with an appertaining one of said drive members; said driving and appertaining driven members being cooperatively engageable in response to driving action of said driving stroke arm, to effect shutter movement of the appertaining shutter sections; and shutter control means operatively associated with certain shutter sections for actuation to prevent operative engagement of the driving and driven members of the appertaining section and thereby control the shutter action of the latter in respect to the appertaining sections; together with selectively operable means for actuating at least certain ones of the aforesaid control means.

8. In a ball-rolling game of the type having a ball-rolling board with ball-receiving holes therethrough and a shutter slidable therebelow to block or open the holes to retain balls pocketed therein and free pocketed balls therefrom, improvements as follows, namely: selective shutter means including a plurality of small shutter sections mounted beneath said board and each independently slidable to block or open certain ball pocketing holes; a shuttle motor and at least one stroke arm reciprocated thereby beneath said sections; a drive member carried on the stroke arm for each shutter section; a driven member carried on each shutter section for cooperation with an appertaining one of said drive members; said driving and appertaining driven members being cooperatively engageable in response to driving action of said driving stroke arm, to effect shutter movement of the appertaining shutter sections; and shutter control means operatively associated with certain shutter sections for actuation to prevent operative engagement of the driving and driven members of the appertaining section and thereby control the shutter action of the latter in respect to the appertaining sections; together with selectively operable means for actuating at least certain ones of the aforesaid control means.
said electromagnetic shutter control means for actuating several of the control means selectively.

12. The combination of claim 11 further characterized in that said circuit means includes score switch means actuated by a ball lodged in certain of said closed drop-out openings; a score circuit controlled by said score switch means to set up operating circuits for said selecting switch means depending upon lodgement of balls in said certain drop-out openings; the connection of all of said switch means requiring operation thereof in a predetermined sequence to effect operation of certain of the electromagnetic shutter control means as aforesaid.

13. In a ball-rolling game of the type having a play field with a plurality of diversely located ball out-pockets in and from which balls are respectively held and released by shutter panel means slidable therebeneath, improvements in selective shutter means comprising: a plurality of individually shiftable shutter devices each operatively associated with several adjacentl grouped out-pockets located in diverse areas of the play field, each said shutter device being shiftable into a ball-holding or a ball-releasing position relative to its associated group of out-pockets; electrically controlled power means for shifting said shutter devices; means operable to actuate said power means to shift any shutter device directly interconnected therewith; electrically controlled coupling means operable to couple and uncouple each shutter device in driving interconnection with said power means; together with circuit and switch means connected for operation to actuate the coupling means for any one or all of said shutter devices to determine which of the latter shall be shifted by actuation of the power means whereby to render the out-pockets appertaining to any shutter device temporarily open or closed so that any balls lodged thereby can be held therein or released therefrom.

14. In a ball-rolling game of the type having a ball field in which are a multiplicity of diversely located ball pockets opened and closed by a shutter panel slidable therebeneath, improvements comprising: the subdivision of the shutter panel into a plurality of independently slidable sections each operatively associated with a particular group of said pockets in the appertaining area of the ball field served thereby, each said shutter section being shiftable into a ball-holding or ball-releasing position relative to its associated group of pockets; electrically controlled coupling means for certain of said shutter sections; electrically operated drive means providing a source of shifting power for said shutter sections and to which the latter are drivingly coupled and uncoupled by the appertaining coupling means; together with control circuit means including at least starting switch means and selecting switch means connected for operation to effect actuation of said drive means and at least some of said coupling means, means for causing a desired shutter section to shift into or from one of said holding or releasing positions.

15. In an amusement apparatus, the combination, with a ball-playing support having a multiplicity of ball-receiving out-pockets diversely situated over a substantial part of the ball-playing area thereof, of improvements comprising, namely: a subdivided shutter panel consisting of a plurality of independently movable sub-sections each shiftable to and from a ball-holding and a ball-releasing control position, each sub-section having associated therewith a group of adjacentl related out-pockets from which the release of balls is controlled thereby; electromechanical drive means providing a source of shifting power for said sub-sections; individual electromechanical coupling means operatively associated with each sub-section and operable in a first condition to provide a driving interconnection with said drive means for changing the control position of the appertaining shutter section responsive to actuation of the drive means, and further operable in a second condition to drivingly disassociate the appertaining subsection from said drive means to prevent changing the control position thereof, by action of said drive means only if the appertaining shutter is in a certain one of said control positions.

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