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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Ball return control apparatus.**

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Description

This invention relates to control apparatus for a pool table having a playing surface and ball-receiving pockets in which balls from the playing surface may be accommodated. The pockets communicate with a retrieval compartment to which pocketed balls may be delivered for retrieval under the control of a gate that is movable between two positions in one of which the balls may pass into the compartment and in the other of which movement of the balls into the compartment is blocked.

Coin controlled pool tables are in wide usage and each such table conventionally has a playing surface adjacent which are several pockets for the accommodation of a cue ball and a complement of object balls. Each pocket has associated therewith a runway leading to a trough which, in turn, leads to a compartment from which pocketed balls may be retrieved. It is conventional to prevent retrieval of pocketed object balls until such time as one or more coins of predetermined denominations are deposited in a coin controlled actuating mechanism which then is operable to enable access to such balls.

Many of the mechanisms currently in use for limiting access to pocketed object balls and separating the cue and object balls perform their intended functions satisfactorily, but have some disadvantages. For example, most of the control mechanisms currently in use are composed of complex linkage assemblies which are expensive to manufacture and assemble and require frequent maintenance. Because of the complexity of such mechanisms proper maintenance requires skilled personnel and usually takes considerable time. In many instances, mainenance or repair of the control mechanism necessitates removal of the pool table from service for an inordinate period of time.

A relatively simple ball control mechanism is disclosed in US-A-4,726,583. Such mechanism utilizes a movable, magnetically permeable gate which normally occupies a ball-blocking position in the path of balls enroute to the ball retrieval compartment but which is movable to an inactive position in response to the actuation of a coin operated actuating assembly. Once the gate has been moved to its inactive position it remains in such position until all balls have passed the gate whereupon the latter returns automatically to its ball-blocking position. Although this mechanism performs its intended function quite well, it does not have the capability of permitting more than one game to be played without depositing one or more additional coins.

A ball control apparatus according to the pre-characterizing portion of claim 1 is known from DE-A-36 03 288. This document discloses a ball control apparatus for selectively disabling and enabling delivery of one or more balls to a ball retrieval compartment, said apparatus comprising a ball-supporting pathway leading to said compartment, a gate movable between first and second position in which said gate respectively prevents and permits passage of a ball along said pathway to said compartment, latch means exerting a latching force on said gate and releasibly retaining the gate in said first position, and drive means by which said gate is movable to its second position.

For some purposes the necessitiy of actuating the ball control mechanism following the completion of each game is satisfactory. In other instances, however, it is preferred to enable players access to the ball retrieval compartment, whenever desired, within a given period of time. In those instances the ball-blocking mechanism must be disabled for the given time period.

It is the object of the invention to provide ball control apparatus that is operable selectively to prevent the playing of more than one game per operation of the coin actuating mechanism, or to permit access to all balls for a limited period of time, or to permit the playing of a selected number of games.

According to the invention this object is solved in that said latch means is movable and said drive means is coupled to said latch means for moving the latter from one position to another position, in said one position the latch means exerting a latching force on said gate and in said another position the gate being movable to its second position.

Apparatus constructed in accordance with the invention is adapted for use in conjunction with a pool table having a playing surface adjacent which ball-accommodating pockets are associated. Each pocket communicates with a downwardly inclind runway which, in turn, communicates with a trap by means of which all pocketed balls are delivered by gravity to a pathway leading to ball retrieval compartment. Interposed between the trap and the retrieval compartment is a barrier or gate which is movable between positions in one of which it blocks passage of pocketed balls to the compartment and in the other of which it permits passage of such balls to the compartment. Movement of the gate to its ball-blocking position is effected by a movable latch which, in response to movement through a selected distance to a latching position, bears against and latches the gate in its ball-blocking position. Movement of the latch from its latching position to an inactive position effects disengagement of the latch and the gate, thereby enabling movement of the balls past the gate to the retrieval compartment. Movement of the latch is effected by an electric motor, a solenoid, or other suitable driving device.

The force under which the gate normally is held latched in its closed position is such as to maintain the gate closed regardless of the number of balls which may occupy the trap. However, once the latch has been moved to its inactive position, even a single ball in the trap is capable of exerting on the gate a force sufficient to effect opening thereof, thereby enabling each ball in the trap to pass the gate.

The time that the latch remains in its inactive position depends upon the latch operating mechanism that is actuated. In one embodiment of the invention the gate will be re-latched in its ball-blocking position shortly after the last ball in the trap passes the gate. In another embodiment the latch is maintained in its inactive position for a selected period of time, thereby enabling pocketed balls to be retrieved from the retrival compartment throughout such time period.

The latch comprises a rotary cam having a radially projecting rise or lobe operable in one position of the cam to engage and hold the gate in its ball-blocking position. Such cam also has radially recessed surfaces which may be spaced sufficiently far from the gate as to enable the gate to pass balls freely.

The apparatus preferably is wholly contained within a drawer-like housing which may be slid as a unit into and out of a space formed at one end of the table. Thus, the entire assembly may be removed from the table as a unit for maintnance and servicing when required. If maintenance or servicing of the assembly will require more than a few minutes, the unit requiring attention may be replaced by a different unit, thereby avoiding prolonged disuse of the affected table.

The presently preferred embodiments of the invention are disclosed in the following description and illustrated in the accompanying drawings, wherein:

Figure 1 is an isometric view of a pool table of the kind with which apparatus constructed in accordance with the invention is adapted for use;

Figure 2 is a fragmentary, sectional view on a greatly enlarged scale and taken on the line 2-2 of Figure 1;

Figure 3 is a view similar to Figure 2, but illustrating some of the parts in adjusted positions;

Figure 4 is a sectional view taken on the line 4-4 of Figure 3;

Figure 5 is a sectional view, on an enlarged scale, taken on the line 5-5 of Figure 2;

Figure 6 is a sectional view like Figure 5, but illustrating some of the parts in adjusted positions;

Figure 7 is a flow diagram of one routine for which the apparatus may be programmed;

Figure 8 is a flow diagram of a second routine; and

Figure 9 is a side elevational view of a modified latch driving apparatus.

Apparatus constructed in accordance with the preferred embodiments of the invention is adapted for use with a pool table 1 comprising a frame 2 supported on legs 3 and having a horizontal, rectangular playing surface 4 bounded by rails 5 on which cushions 6 are supported, as is conventional. At each of the four corners of the playing surface is an opening or pocket 7 and a similar pocket 7 is associated with each of the two opposed, longer side rails 5. A complement of fifteen object balls O and one cue ball C are used in conjunction with the table, and each of such balls preferably is of uniform diameter and capable of being pocketed in any of the openings 7.

Each of the openings 7 has associated therewith a downwardly inclined runway 8 which extends from adjacent the associated opening inwardly toward the center of the table and communicates with a common trough 9 which is downwardly inclined toward one end of the table.

At that end of the table toward which the trough 9 slopes is a space within which a drawer 10 slideably is accommodated. The drawer comprises a bottom 11 having upstanding, spaced apart side walls 12, a rear wall 13, and a front wall 14. Two side-by-side openings are formed in the front wall 14. One opening leads to a recess 15 adjacent one side wall 12 and the other leads to a ball retrieval compartment 16 accessible via its opening. The recess and the compartment are separated by a partition 17. The purposes of the recess 15 and the compartment 16 will be explained hereinafter. The rear wall 13 is provided with an opening 18 through which the terminal end of the trough 9 may extend.

Between the rear and front walls 13, 14 of the drawer 10 and parallel thereto is a pair of vertical partitions 19 and 20 which are spanned by a support 21 that is inclined downwardly toward the front wall 14. See Figure 4. Mounted on the support 21 is a trap 22 comprising a preferably molded, unitary body 23 having an upwardly open groove or pathway 24 formed therein. The pathway has two segments 25 and 26. The pathway segment 25 is inclined downwardly to the right, and the pathway segment 26 is inclined downwardly to the left. These inclinations, coupled with the forward pitch of the support 21, enable the pathway to be sufficiently inclined to ensure downward movement by gravity of the object balls along the pathway.

Interposed between the ball delivery trough 9 and the upper or inlet end of the trap pathway 24 is transfer means designated generally by the refer-

ence character 28 for diverting the cue ball C from the pathway 24 to another pathway and directing the object balls O to the pathway 24. The transfer device is exactly like that disclosed in the aforementioned patent.

Object balls O introduced to the upper end of the pathway 24 roll downwardly along the latter toward an opening 30 formed in the partition 17. See Figures 2 and 4. Fixed to the partition 17 and overlying the opening 30 is a mounting block 31. A gate 32 formed of metal or any other suitable material lies athwart the path of movement of the balls at the opening 30. The gate is pivoted at its upper end to the mounting block 31 by means of a hinge 33 for swinging movements about a horizontal axis.

Spaced from, but parallel to, the partition 17 is a second partition 34. Spanning the partitions 17 and 34 is a downwardly inclined ramp 35 which, toether with the partitions, forms a channel 36 for the accommodation of balls which pass through the opening 30. The channel 36 is closed at one end by a wall 37.

Latch means designated generally by the reference character 38 is provided for controlling the position of the gate 32. In the embodiment shown in Figures 2-6 the latch means comprises a rotary cam 39 having two parallel flat sides 40 at opposite ends of which are rises or lobes 41. The cam is fixed to the armature shaft 43 of an electric motor 44 that is mounted on the wall 37. The arrangement is such that, when a lobe 41 bears against the gate 32 as is shown in Figure 5, the gate is latched in a position in which it blocks the passage of balls through the opening 30. When the cam is rotated to a position in which one of the flat sides 40 confronts the gate, there is sufficient space between the cam and the gate to enable a ball on the trap to swing the gate to an open position, pass the gate, and enter the channel 36 via the opening 30.

Coin actuating means 45 (Figures 1 and 2) is provided to control the operation of the latch means 38 and comprises a reciprocable slide 46 forming part of a coin controlled mechanism 47 of known construction and mounted on a shelf 48 spanning the partition 34 and the adjacent side wall 12. The slide is accessible via the recess 15. A spring 49 constantly biases the slide 46 to the position shown in Figure 2. A normally open switch 50 lies in the path of movement in one direction of the slide 46 so as to be closed thereby, and is connected to a suitable source of electrical energy such as a battery 42 mounted on the shelf 48. Although not shown in the drawings for purposes of clarity, the switch 50 also has terminals connected to the terminals of the motor 44 so as to energize the latter upon closing of the switch 50.

Disregarding for the moment the gate 32 and its controlling mechanism, a game can be commenced by placing the object balls O and the cue ball C on the playing surface 4 of the table 1. The cue ball is used by one or more players to pocket the object balls.

As each object ball O is pocketed it moves down the associated runway 8 to the trough 9 and enters the drawer unit 10 via the opening 18 in the rear wall 13. The object ball rolls by gravity off the trough 9 onto the transfer device 28 and is guided into the inlet end of the trap segment 25 of the pathway 24 in the manner disclosed in the aforementioned patent. Such object ball will roll downwardly along the pathway 24 until it engages the gate 32 which lies athwart the pathway at the partition 17. If the latch cam 39 then is in its gate latching or active position, one of the lobes 41 of the cam will bear against the gate, thereby enabling the latter to block passage of the
ball through the opening 30. Object balls O which subsequently are pocketed will follow the same route and come to rest against the first and any additional pocketed object balls as is indicated in Figures 2 and 3.

When the game has been completed and all of the object balls are in the trap 22, one or more coins must be inserted in the slide 46 of the coin controlled mechanism 47 so as to enable the slide to be slid from the position shown in Figure 2 toward and into engagement with the switch 50, thereby energizing the motor 44 and driving the latch cam 39 through 90° to an inactive position in which the mass of the object ball or balls in the trap swing the gate 32 from its closed position to its open position as is best shown in Figure 6. Following movement of the cam to its gate releasing or inactive position it remains in that position for a sufficient period of time to permit all of the object balls O on the pathway 24 to roll downwardly and pass in succession through the opening 30 in the partition 17. Thereafter, the slide may be released whereupon the motor rotates the cam 39 to an active position in which one of the lobes 41 bears against the gate and holds the latter in its ball-blocking position.

Balls passing the gate 32 enter the channel 36 and are delivered by gravity to the retrieval compartment 16 in the manner described in the aforementioned patent.

In the event the cue ball C is pocketed prior to the end of the game, the transfer device 28 will divert the cue ball from the path taken by the object balls O in the manner described in the aforementioned patent.

The drawer unit 10 is a fully integrated assmebly and is interchangeable with any other like unit, thereby enabling a unit requiring repair or

maintenance to be replaced by another unit with substantially no loss of playing time. It will be understood that suitable drawer locking means (not shown) will be included as part of the apparatus so as to preclude unauthorized tampering therewith.

In the operation of coin actuated pool games there are two basic kinds of control routines: rack play and time play. In rack play, each pocketed object ball is retained in the trap until the gate latch is actuated in such manner as to enable one complement, or rack, of balls to pass from the trap to the retrieval compartment. Depending upon the construction of the control mechanism, a player may preselect one or a plurality of racks to be played. In time play the gate latch is maintained in its inactive position for a predetermined period of time, thereby enabling any pocketed ball to reach the retrieval compartment during such time period. Following the passage of such time period the gate is latched in its blocking position from which it cannot be moved until a player deposits additional coins and selects either rack play or time play.

In apparatus constructed according to a preferred embodiment of the invention a player has the option of selecting either rack play or time play. The rack play routine is illustrated in flow chart form in Figure 7, whereas the time play routine is illustrated in flow chart form in Figure 8.

In the rack play routine, the player selects such routine by actuating a selector switch (not shown) following which the switch 50 is energized and its shaft 43 driven in a direction to rotate the cam 39 to its gate release position. If desired, a delay timer of known kind interrupts rotation of the latch for a period of time sufficient to enable all balls in the trap to pass the gate 32, whereupon rotation of the latch recommences and continues for a period of time sufficient to reset the latch and hold the gate in its ball blocking position. This operation subtracts one rack from the preset rack counter. If more than one rack has been preset in the rack counter, it is possible to release the gate latch by operation of a start switch, thereby permitting as many successive racks of balls to be released as have been preset in the rack counter. When the last of the preset racks has been released, the start switch is disabled and the gate control cam is reset for operation only in response to the deposit of additional coins.

When the time play option is selected, by closing of a suitable switch, the payment of a predetermined sum of money will energize the gate release latch driving motor 44 and drive the latch to its inactive position, thereby enabling balls in the trap to pass the gate and be received in the ball retrieval compartment. At the same time, a timer will be energized to interrupt operation of the motor and thereby maintain the latch cam in its inactive position. Following the elapse of a predetermined portion of the selected time period, a signal may be energized to warn the players of the approaching end of the time period. At the expiration of the time period the latch driving motor again will be energized to drive the latch cam to its active position and hold the gate in its ball blocking position. The system then will be in condition to be reactivated in either the rack play or the time play routine.

Many different variations of the two routines may be devised as will be understood by those skilled in the electric motor drive programming art.

It is not essential that the latch cam drive means constitute an electric motor. As shown in Figure 9, it is possible to use other drivers, such as a solenoid 52 having a winding 53 connected to a suitable source of energy by wiring 54. The solenoid includes an extensible and retractable armature 55 having a toothed rack 56 in mesh with a pinion 57 fixed to one end of a shaft 58 journalled in the wall 37 and having its other end fixed to the latch cam 39. Extension and retraction of the armature 54 will effect rocking of the cam between its latching and inactive positions in a manner like that referred to earlier.

Claims

1. Ball control apparatus for selectively disabling and enabling delivery of one or more balls (0) to a ball retrieval compartment (16), said apparatus comprising

- a ball-supporting pathway (24) leading to said compartment,
- a gate (32) movable between first and second positions in which said gate respectively prevents and permits passage of a ball along said pathway to said compartment,
- latch means (39) exerting a latching force on said gate (32) and releasibly retaining the gate in said first position,
- and drive means (44, 52) by which said gate is movable to its second position,

characterized in that

- said latch means (39) is movable and
- said drive means (44, 52) is coupled to said latch means (39) for moving the latter from one position to another position,
- in said one position the latch means exerting said latching force on said gate (32) and in said another position the gate being movable to its second position.

2. Apparatus according to claim 1 wherein said gate is mounted for rocking movements between said first and second positions.

3. Apparatus according to claim 1 wherein said pathway has an inclination such that by a single ball on said pathway said gate is movable to its second position when said latch means is in said another position.

4. Apparatus according to claim 1 wherein said latch means when in said one position engages said gate.

5. Apparatus according to claim 1 wherein said latch means when in said another position is disengaged from said gate.

6. Apparatus according to claim 1 wherein movement of said latch means from said another position to said one position effects engagement of said latch means with said gate and movement of the latter to said first position.

7. Apparatus according to claim 1 wherein said latch means comprises a cam (39).

8. Apparatus according to claim 7 wherein said cam is rockable about an axis.

9. Apparatus according to claim 8 wherein said drive means comprises a motor (44) having a rotary shaft (43) connected to said cam.

10. Apparatus according to claim 1 including means for disabling return movement of said latch means from said another position to said first position for a period of time at least sufficient to enable all balls on said pathway to pass said gate.

11. Apparatus according to claim 1 including time delay means for disabling return of said latch means from said another position to said first position for a selected period of time more than sufficient to enable all balls on said pathway to pass said gate.

12. Apparatus according to claim 1 wherein said drive means comprises a solenoid (52) having a reciprocable rack (56) in mesh with a rotary pinion (57) fixed to said latch means.

Revendications

1. Appareil de commande de boules destiné à interdire et à autoriser sélectivement l'amenée d'une ou plusieurs boules (0) sur un logement de récupération de boules (16), cet appareil comprenant
   - une voie de roulement de boules (24) menant au logement,
   - un portillon (32) mobile entre les première et seconde positions dans lesquelles le portillon empêche et autorise respectivement le passage d'une boule le long de la voie de roulement à destination du logement,
   - des moyens de verrouillage (39) exerçant une force de verrouillage sur le portillon (32) et retenant de façon libérable la porte dans la première position,
   - et des moyens d'entraînement (44, 52) permettant de déplacer le portillon sur sa seconde position,

   caractérisé en ce que
   - le moyen de verrouillage (39) est mobile et
   - les moyens d'entraînement (44, 52) sont accouplés au moyen de verrouillage (39) pour déplacer ce dernier d'une position sur une autre position,
   - dans une position le moyen de verrouillage exerçant la force de verrouillage sur le portillon (32) et dans une autre position, le portillon pouvant se déplacer sur sa seconde position.

2. Appareil selon la revendication 1, dans lequel le portillon est monté de façon à permettre des mouvements culbutants entre les première et seconde positions.

3. Appareil selon la revendication 1, dans lequel la voie de roulement présente une inclinaison telle qu'avec une seule boule sur la voie de roulement, le portillon peut se déplacer sur sa seconde position lorsque le moyen de verrouillage se trouve dans une autre position.

4. Appareil selon la revendication 1, dans lequel le moyen de verrouillage lorsqu'il se trouve dans une position est en contact avec le portillon.

5. Appareil selon la revendication 1, dans lequel le moyen de verrouillage, lorsqu'il se trouve dans une autre position est libéré du portillon.

6. Appareil selon la revendication 1, dans lequel le mouvement des moyens de verrouillage à partir d'une position sur une autre position entraîne la coopération du moyen de verrouillage avec le portillon et le mouvement de ce dernier sur la première position.

7. Appareil selon la revendication 1, dans lequel le moyen de verrouillage comprend une came (39).

8. Appareil selon la revendication 7, dans lequel la came peut culbuter autour d'un axe.

9. Appareil selon la revendication 8, dans lequel le moyen d'entraînement comprend un moteur (44) ayant un arbre rotatif (43) raccordé à la came.

10. Appareil selon la revendication 1 comprenant des moyens pour empêcher le mouvement retour du moyen de verrouillage à partir d'une autre position sur la première position pendant une durée au moins suffisante pour permettre à toutes les boules se trouvant sur la voie de roulement de franchir le portillon.

11. Appareil selon la revendication 1, comprenant des moyens de temporisation pour empêcher le retour du moyen de verrouillage de la deuxième position à la première position pendant une durée sélectionnée supérieure au temps suffisant pour permettre à toutes les boules se trouvant sur la voie de roulement de franchir le portillon.

12. Appareil selon la revendication 1, dans lequel les moyens de fonctionnement comprennent un solénoïde (52) ayant une crémaillère à mouvement alternatif (56) en prise avec un pignon rotatif (57) fixé sur le moyen de verrouillage.

Patentansprüche

1. Kugelsteuereinrichtung zum wahlweisen Verhindern und Freigeben der Abgabe einer oder mehrerer Kugeln (0) an ein Kugelrückgabefach (16), wobei die Einrichtung folgende Elemente enthält:

   - einen kugeltragenden Laufweg (24), der zum Kugelrückgabefach führt,
   - eine zwischen einer ersten und einer zweiten Position bewegliche Sperre (32), wobei die Sperre in diesen Positionen den Lauf einer Kugel längs des Laufweges zum Kugelrückgabefach verhindert bzw. freigibt,
   - eine Verriegelungseinrichtung (39) zur Ausübung einer Verriegelungskraft auf die Sperre (32) und zum lösbaren Halten der Sperre in der ersten Position,
   - und eine Antriebseinrichtung (44, 52), durch die die Sperre in ihre zweite Position geführt wird,

   dadurch gekennzeichnet, daß

   - die Verriegelungseinrichtung (39) beweglich ist und
   - die Antriebseinrichtung (44, 52) mit der Verriegelungseinrichtung (39) verbunden ist, um die letztere aus der einen in eine andere Position zu bewegen,
   - wobei in der einen Position die Verriegelungseinrichtung die Verriegelungskraft auf die Sperre (32) ausübt und wobei in der anderen Position die Sperre zu ihrer zweiten Position hin beweglich ist.

2. Einrichtung nach Anspruch 1, wobei die Sperre zur Hin- und Herbewegung zwischen einer ersten und einer zweiten Position befestigt ist.

3. Einrichtung nach Anspruch 1, wobei der Laufweg derart geneigt ist, daß durch eine einzige Kugel auf dem Laufweg die Sperre in ihre zweite Position bewegt wird, sofern die Verriegelungseinrichtung in ihrer anderen Position steht.

4. Einrichtung nach Anspruch 1, wobei die Verriegelungseinrichtung in der einen Position die Sperre verriegelt.

5. Einrichtung nach Anspruch 1, wobei die Verriegelungseinrichtung in der anderen Position von der Sperre gelöst ist.

6. Einrichtung nach Anspruch 1, wobei die Bewegung der Verriegelungseinrichtung aus der anderen in die eine Position das Lösen der Verriegelungseinrichtung von der Sperre sowie die Bewegung der Sperre in die erste Position bewirkt.

7. Einrichtung nach Anspruch 1, wobei die Verriegelungseinrichtung eine Steuerfläche (39) enthält.

8. Einrichtung nach Anspruch 7, wobei die Steuerfläche um eine Achse hin- und herbeweglich ist.

9. Einrichtung nach Anspruch 8, wobei die Antriebseinrichtung einen Motor (44) enthält, der eine mit der Steuerfläche verbundene Drehwelle (43) aufweist.

10. Einrichtung nach Anspruch 1, enthaltend eine Einrichtung zur Verhinderung der Rückbewegung der Verriegelungseinrichtung aus der an-

deren Position in die erste Position für eine Zeitspanne, die wenigstens das Passieren der Sperre durch alle Kugeln auf dem Laufweg gestattet.

11. Einrichtung nach Anspruch 1, enthaltend eine Zeitverzögerungseinrichtung zur Verhinderung der Rückbewegung der Verriegelungseinrichtung aus der anderen Position in die erste Position für eine gewählte Zeitspanne, die mehr als ausreichend ist, um das Passieren der Sperre durch alle Kugeln auf dem Laufweg zu gestatten.

12. Einrichtung nach Anspruch 1, wobei die Antriebseinrichtung einen Elektromagnet (52) enthält, der eine hin- und herbewegliche Zahnstange (56) in Eingriff mit einem an der Verriegelungseinrichtung befestigten drehbaren Ritzel (57) aufweist.

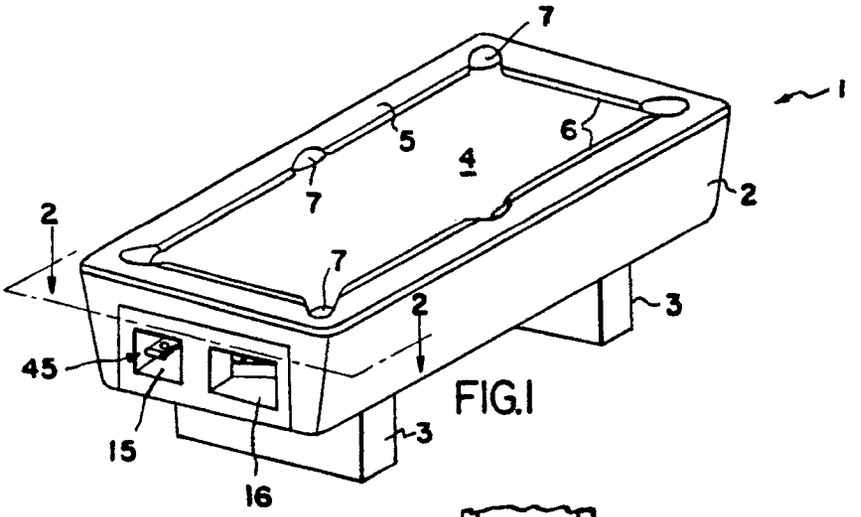
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FIG.1

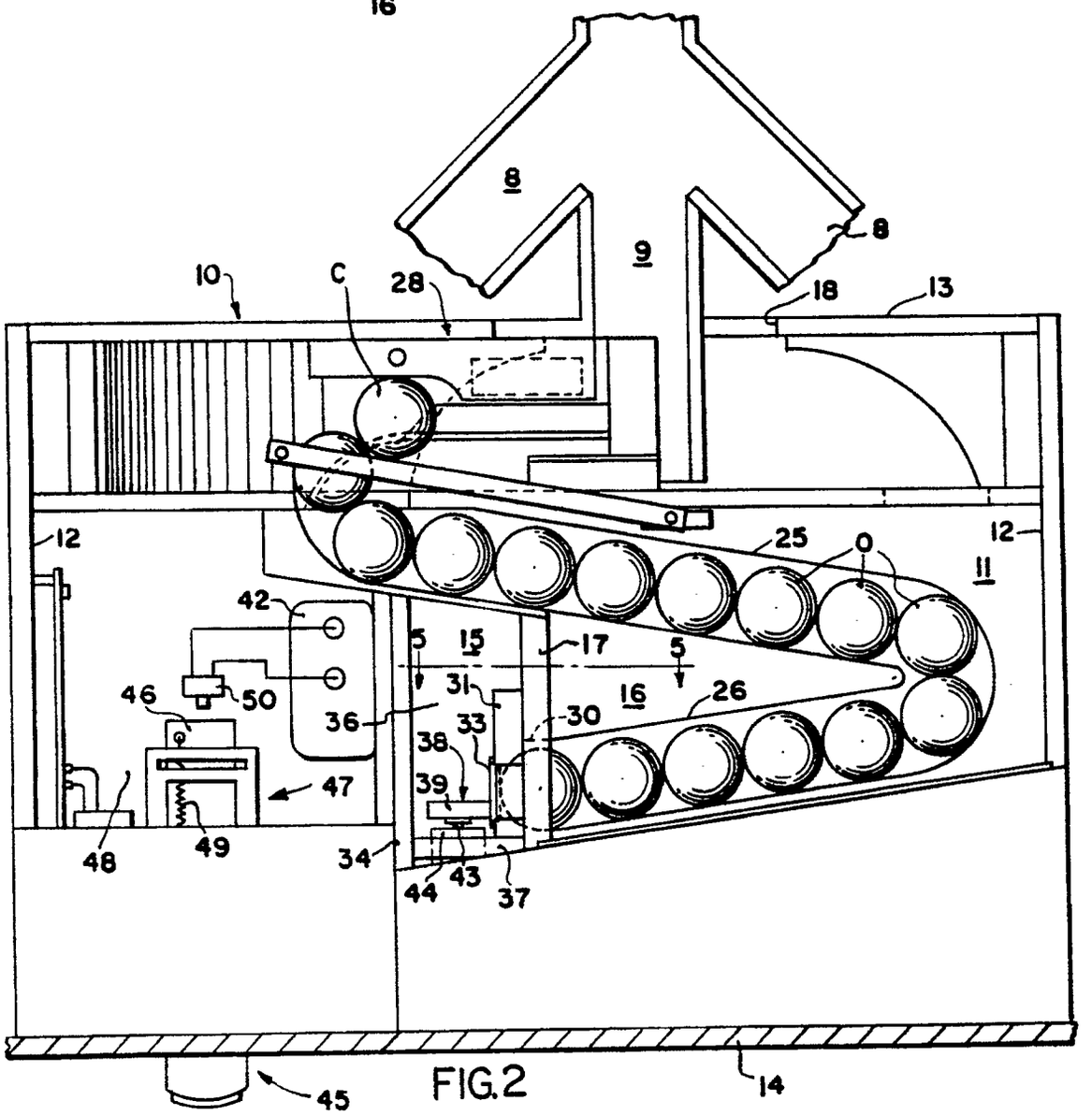
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FIG.2

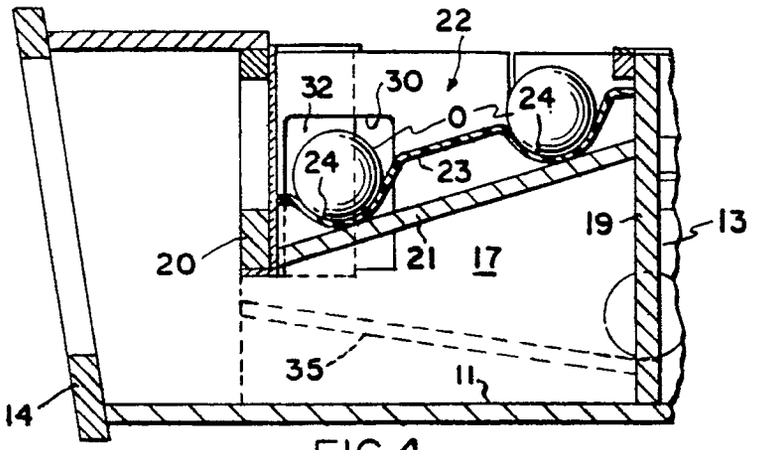

FIG.4

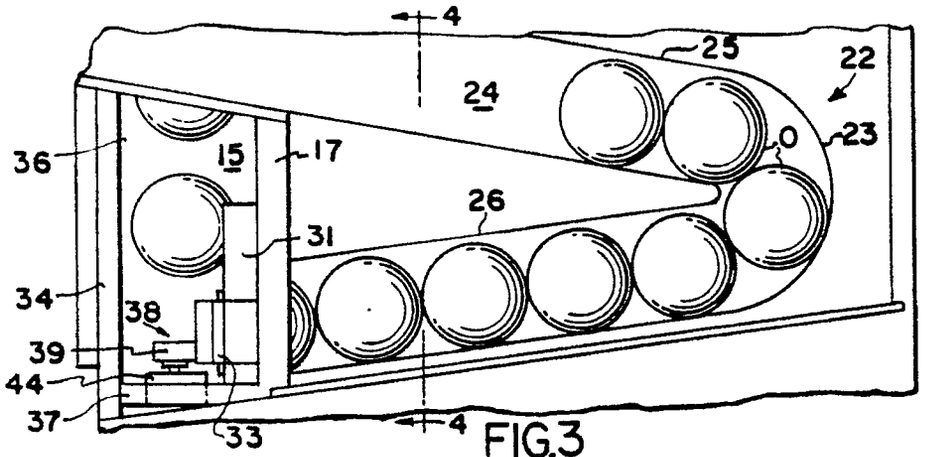

FIG.3

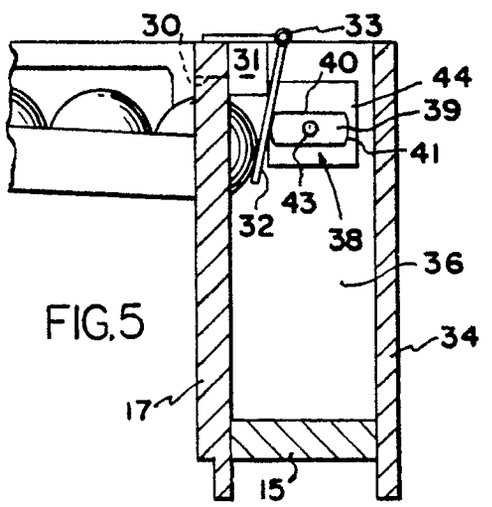

FIG.5

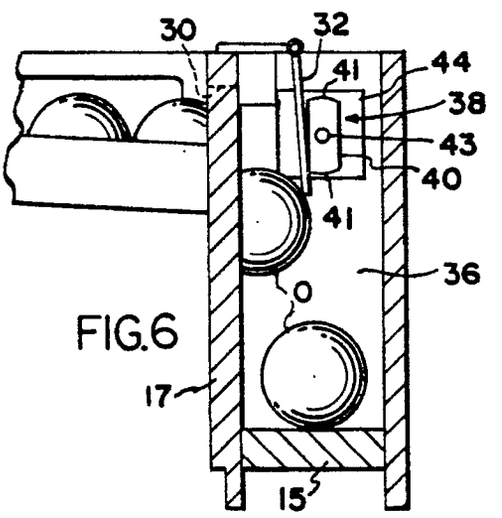

FIG.6

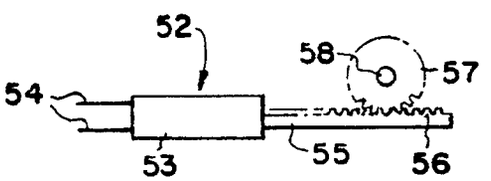

FIG.9

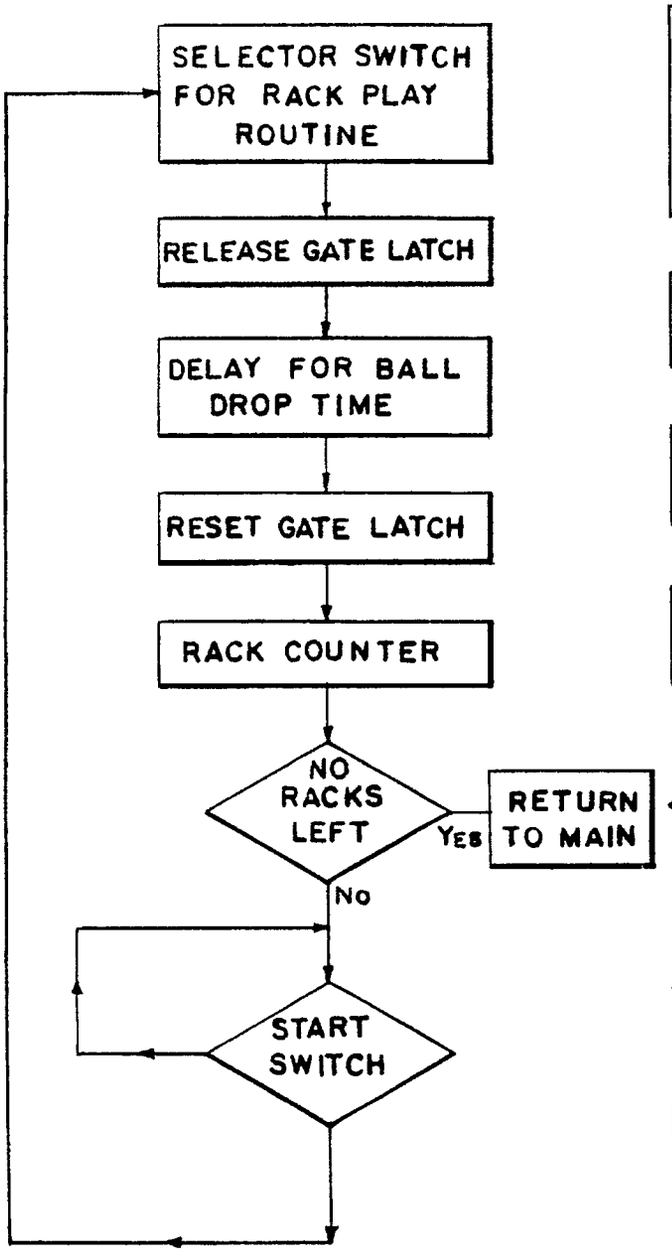
SELECTOR SWITCH FOR RACK PLAY ROUTINE
RELEASE GATE LATCH
DELAY FOR BALL DROP TIME
RESET GATE LATCH
RACK COUNTER
NO RACKS LEFT
Yes
RETURN TO MAIN
No
START SWITCH

FIG.7

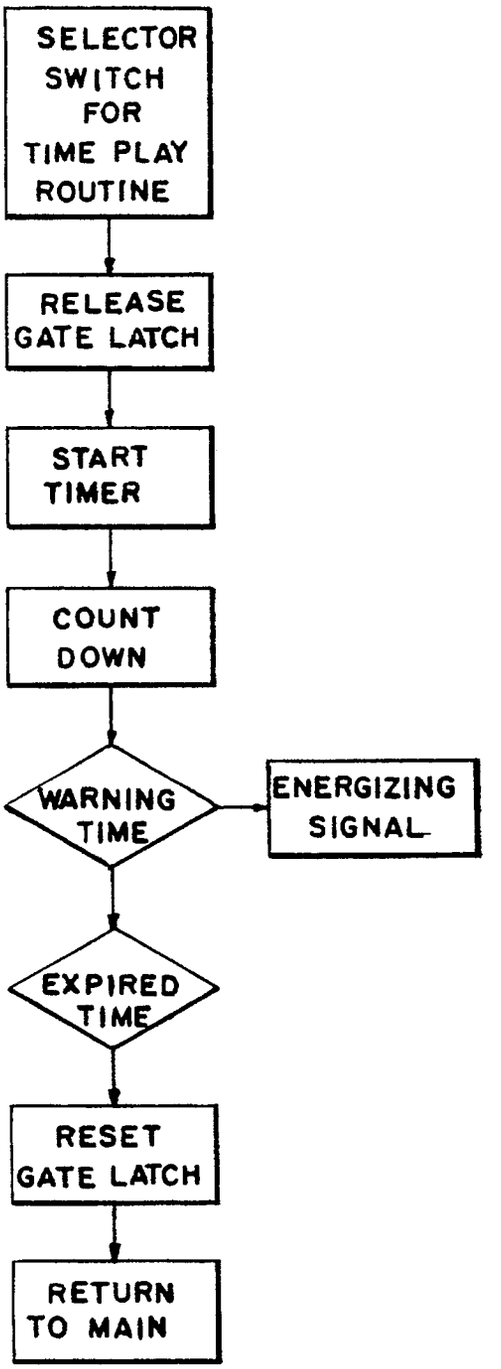
SELECTOR SWITCH FOR TIME PLAY ROUTINE
RELEASE GATE LATCH
START TIMER
COUNT DOWN
WARNING TIME
ENERGIZING SIGNAL
EXPIRED TIME
RESET GATE LATCH
RETURN TO MAIN

FIG.8