Oct. 2, 1956 J. ZUERCHER ET AL 2,765,172

BOWLING BALL HANDLING AND RETURN MECHANISM

Filed May 1, 1951 4 Sheets-Sheet 1

FIG. 2

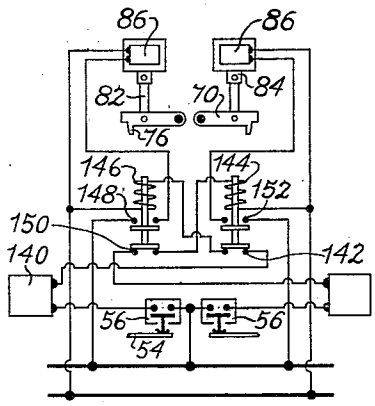


FIG. 1

INVENTOR
ALFRED E. LEVENDOSKI
JOHN ZUERCHER
BY LEOPOLD STRAUSS
Wentworth & Clapham
ATTORNEY

Oct. 2, 1956 J. ZUERCHER ET AL 2,765,172

BOWLING BALL HANDLING AND RETURN MECHANISM

Filed May 1, 1951 4 Sheets-Sheet 2

FIG. 3

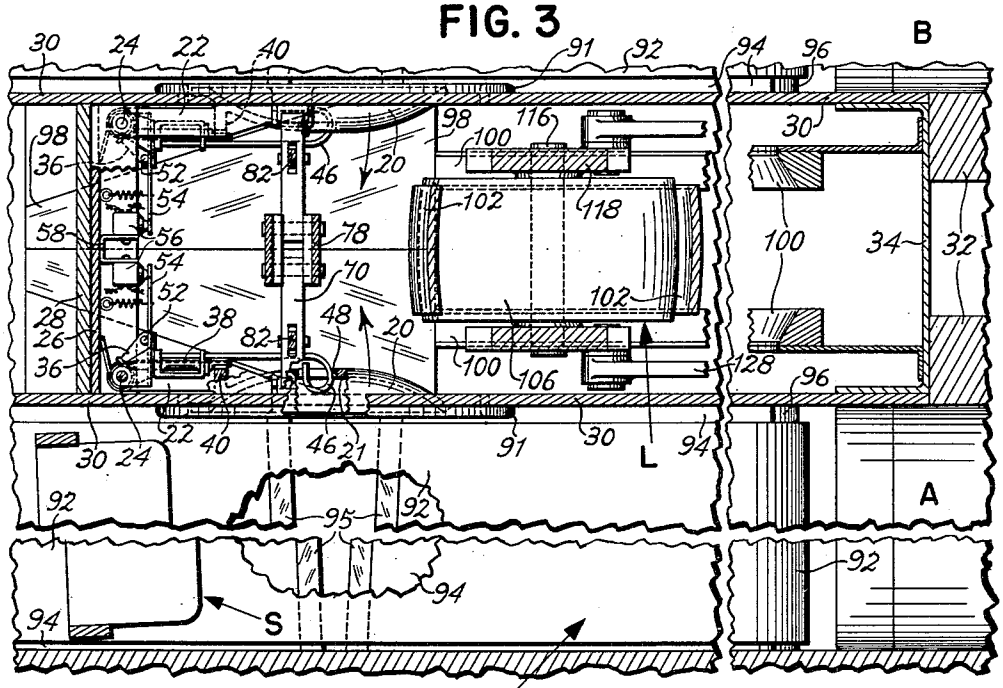


FIG. 4

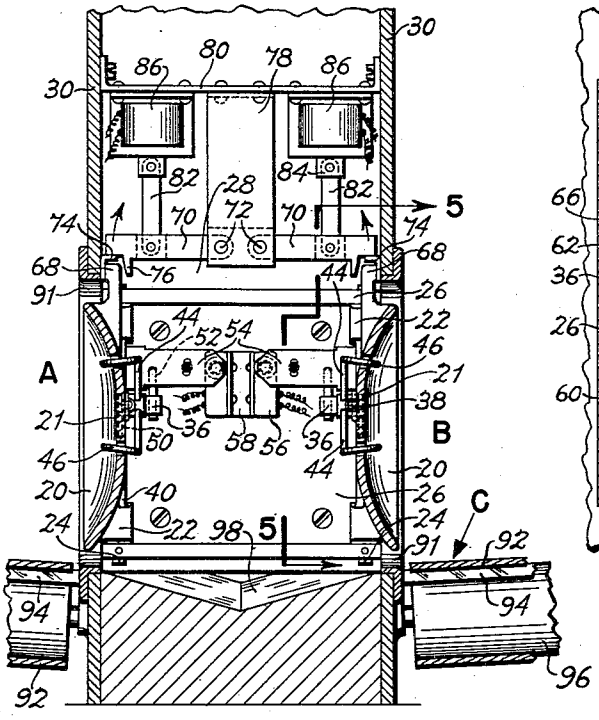
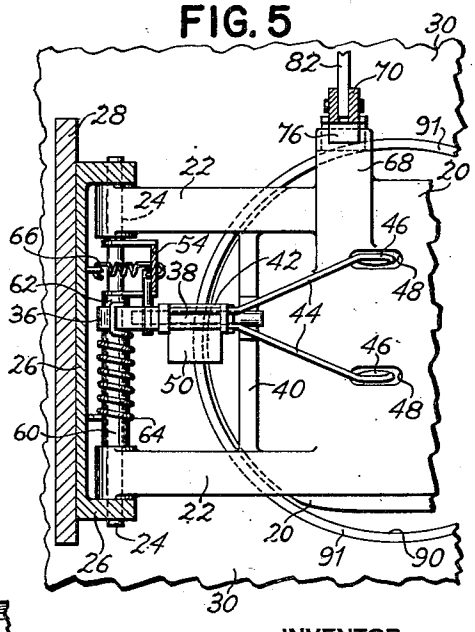


FIG. 5



INVENTOR
ALFRED E. LEVENDOSKI
JOHN ZUERCHER
BY LEOPOLD STRAUSS
Wentworth S. Clapham
ATTORNEY

Oct. 2, 1956 J. ZUERCHER ET AL 2,765,172

BOWLING BALL HANDLING AND RETURN MECHANISM

Filed May 1, 1951 4 Sheets-Sheet 3

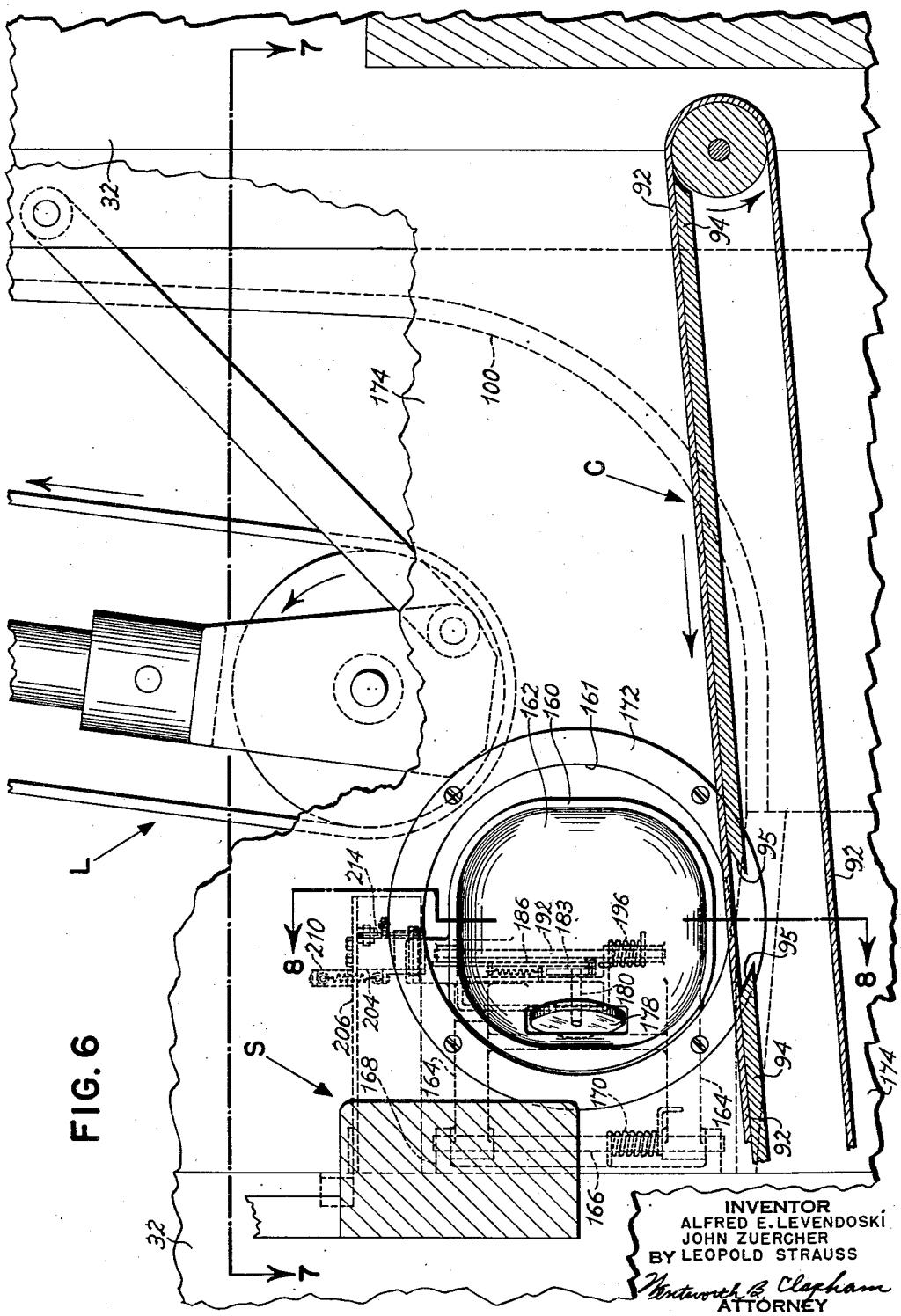


FIG. 6

Oct. 2, 1956 J. ZUERCHER ET AL 2,765,172

BOWLING BALL HANDLING AND RETURN MECHANISM

Filed May 1, 1951 4 Sheets-Sheet 4

FIG. 7

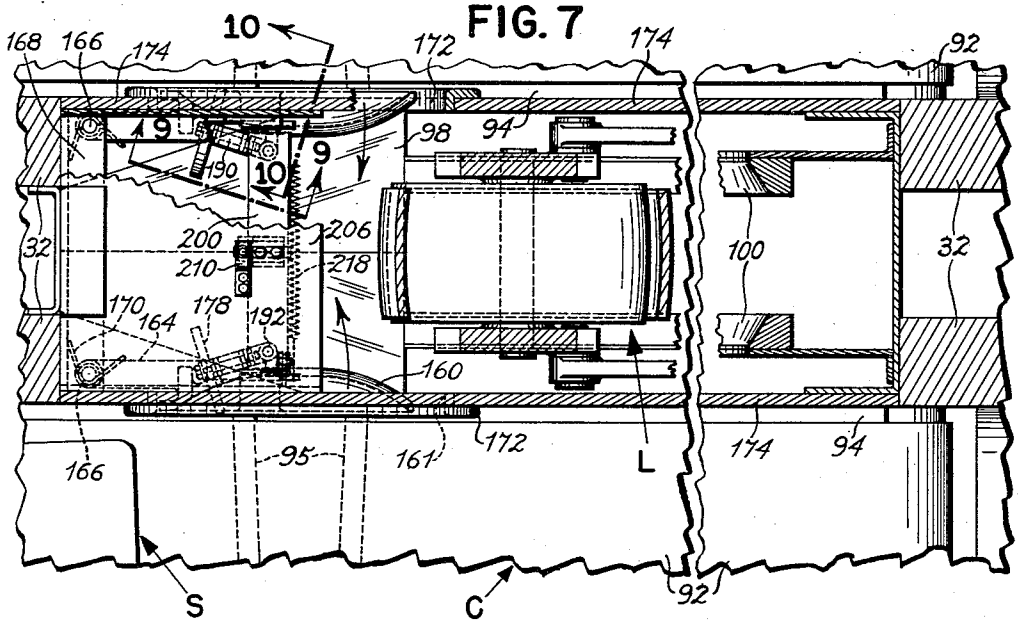


FIG. 9

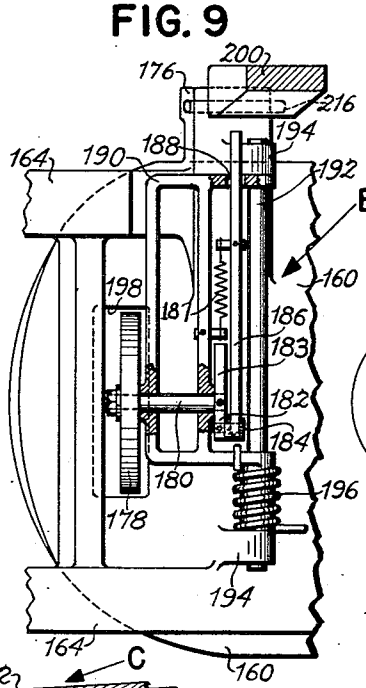


FIG. 10

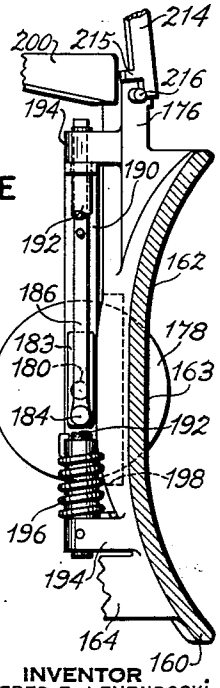
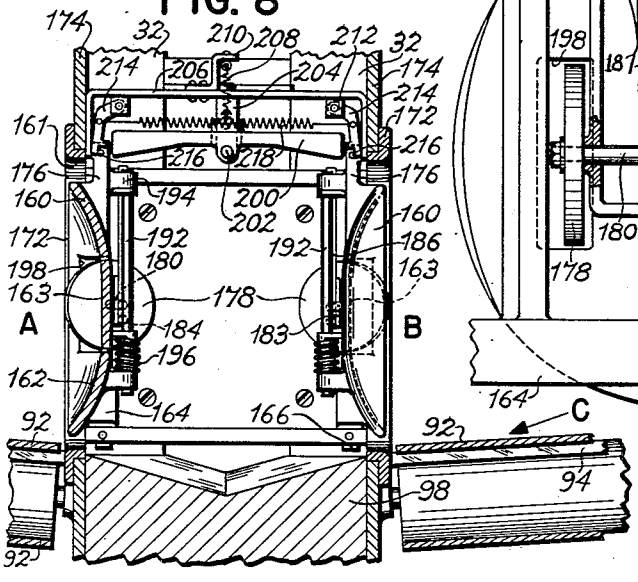


FIG. 8



INVENTOR
ALFRED E. LEVENDOSKI
JOHN ZUERCHER
BY LEOPOLD STRAUSS
Wentworth B. Clapham
ATTORNEY

United States Patent Office 2,765,172 Patented Oct. 2, 1956

2,765,172

BOWLING BALL HANDLING AND RETURN MECHANISM

John Zuercher, Buffalo, Alfred E. Levendoski, Depew, and Leopold Strauss, Buffalo, N. Y., assignors to American Machine & Foundry Company, a corporation of New Jersey

Application May 1, 1951, Serial No. 224,016

23 Claims. (Cl. 273—49)

This invention relates to bowling ball handling and return mechanisms, and more particularly to apparatus for effecting the removal of bowling balls from the pit of a bowling alley and delivering them to return mechanism for return to a player at the head of a bowling alley.

The mechanism constituting the invention is designed for the purpose of effecting the rapid removal of bowling balls from the pit of a single alley, or from the pits of two adjacent alleys without interference from pins and without pins being delivered to the ball return device where they would interfere with the proper operation of the mechanism constituting the invention and result in jams, breakage of parts, or loss of time in playing the game.

In many bowling establishments, it is customary to provide a common ball return for use with two adjacent bowling alleys, the ball return being located between the two alleys. With this type of arrangement, when balls are delivered from the pits of the alleys to the return runway, it is desirable to control the delivery of the balls in order that they will not be removed or delivered from both pits simultaneously and collide as they leave the pits for further handling and placement on the return runway, which results in damage to the balls and hence complaints by patrons to the alley proprietor.

According to the invention, means are provided in the form of a gate located in the kickback of each of the alleys adjacent the ball return runway. Each gate is so operated and controlled that the first ball unlocking a gate will be delivered to the ball return mechanism which conveys it to the common ball return runway. Furthermore, there is provided means which prevent unlocking of a gate by a bowling pin. Therefore a pin cannot be delivered to the bowling ball handling mechanism where it would interrupt the proper operation of the mechanism and cause possible jams or breakage.

The invention can also be used with a single alley where it is desired to effect the rapid removal of balls from the pit and their delivery to ball handling mechanism, which in turn conveys the ball to a ball return runway for delivery to a player.

The invention can be used with bowling alleys where pins are set manually, in which case the ball can be directed into operative relationship with the gate by a pin boy, who can roll the ball with his foot into gate unlocking position, whereupon the gate opens and the ball runs through the open gate into the range of action of the ball handling and delivery mechanism. The invention can also be used with automatic bowling pin spotting machines, as shown in the drawings, in which case balls are moved automatically into engagement with the gate unlocking mechanism and, depending upon which ball is first to unlock a gate, that ball is delivered first to the common return runway as noted above. An interlock mechanism forming a part of this invention affords the proper controlled movement of balls through one gate or the other without danger of balls colliding because of their simultaneous removal from the pits of the two adjacent alleys.

It is an object of the invention to provide an improved bowling ball handling and return mechanism for use with bowling alleys in effecting the movement of bowling balls out of the pit of a single alley, or out of the pits of two adjacent alleys.

It is a further object of our invention to provide a mechanism for removing bowling balls from the pits of two adjacent bowling alleys for delivery to a common ball return in which interlock mechanism is provided for preventing the simultaneous removal of bowling balls to the mechanism which delivers the balls one by one to a common ball return.

It is a further object of our invention to provide mechanism for removing bowling balls from the pit of a single alley or from the pits of two side-by-side alleys for delivery to a common ball return runway wherein the kickback adjacent the ball return runway is provided with a ball operated gate through which a ball may move into the range of action of a device which delivers the ball to a runway serving the single alley, or a runway which is common to the two side-by-side alleys, as the case may be. The invention contemplates the use of electrically operated or mechanically operated mechanism for controlling the operation of the gates and the kickbacks.

A further object of the invention is to provide a safety gate control and locking mechanism, for use with gates, mounted in openings in the kickbacks of bowling alleys such that the gate unlocking mechanism cannot be opened by a bouncing ball or by a single pin or group of pins striking thereagainst.

With these and other objects not specifically mentioned in view, the invention consists in certain combinations and constructions which will be hereinafter fully described, and then set forth in the claims hereunto appended.

In the accompanying drawings which form a part of this specification, and in which like characters of reference indicate the same or like parts:

Fig. 1 is a side elevation illustrating a preferred embodiment of the invention as employed with two adjacent bowling alleys;

Fig. 2 is a circuit wiring diagram of a pair of electrically controlled trap doors;

Fig. 3 is a sectional plan view taken on line **3—3** of Fig. 1;

Fig. 4 is a sectional end elevation taken on line **4—4** of Fig. 1;

Fig. 5 is a partial rear view of one of the trap doors and its operating mechanism taken on line **5—5** of Fig. 4;

Fig. 6 is a side elevation showing a modified form of the invention;

Fig. 7 is a sectional plan view taken on line **7—7** of Fig. 6;

Fig. 8 is a sectional end elevation taken on line **8—8** of Fig. 6;

Fig. 9 is a partial rear view taken on line **9—9** of Fig. 7; and

Fig. 10 is a sectional end elevation taken on line **10—10** of Fig. 7.

In the drawings, the gate or door mechanism is shown mounted in the kickbacks of two adjacent alleys, and arranged to deliver balls from the pits of these alleys to a ball lift for automatic delivery to a ball return runway common to the two alleys. The ball lifting and return mechanism illustrated in the drawings is of the same general type as described and claimed in copending Holloway et al. application, Serial Number 170,162, for Ball Return Mechanism, filed June 24, 1950. If desired, other types of ball return mechanisms can be used.

Referring to Figures 1, 3, 4 and 5, which show a preferred embodiment of the invention, each of the trap

doors or gates designated generally **20**, is shown as mounted in an opening **90** formed in a kickback. Doors **20** may be flat so that they lie substantially within the kickbacks. It is preferred, however, that they be concave shaped, as shown, since as described hereinafter, this permits better handling of balls and also makes it relatively impossible for a pin to operate the doors, which would cause jamming and delay in the playing of a game.

Door **20** is provided with suitable lugs **22** by means of which the doors or gates **20** are pivotally supported on vertical rods **24**. Since the construction and operating mechanism of each door or gate **20** is the same, a detailed description of one only is necessary.

In the preferred embodiment shown in Figures 1, 3, 4 and 5, hinge rod **24** of gate **20** is supported in a U-shaped hinge bracket **26** secured to cross member **28** mounted between a pair of vertical plates **30** which extend rearwardly from and form a part of kickbacks **32**. A vertical U-shaped member **34**, secured to the cut ends of kickbacks **32** and to plates **30**, rigidly supports plates **30** in operative position. Pivotally mounted on rod **24** is a substantially horizontal arm **36** from the free end of which extends a horizontal rod **38**. Rod **38** is formed with a flat surface engaging with a vertical rib **40** preferably formed integrally with door or gate **20**. As shown in Figures 3 and 5, rod **38** also loosely supports a swivel bracket **42** having attached thereto a pair of feeler or trip rods **44**. Each bracket **42** is provided with a flange **50** which limits the swivel action of bracket **42** on rod **38**. The free ends of rods **44** pass through spaced openings or slots **48** in gate **20**, and are formed with ball engaging portions or trip fingers, such as loops **46**, which project outwardly from the concave outer surface of gate **20** towards the pit. Trip fingers **46** are spaced vertically one above the other and at such a distance that they can be engaged simultaneously by the periphery of a ball, but cannot be so engaged by a bowling pin. This being the case, when both trip fingers **46** are engaged by a ball, the gate **20** can be opened and a ball delivered through opening **90** to ball lifting and delivery mechanism designated generally L. On the other hand, if a pin strikes or bears against a single trip finger **46**, gate **20** remains closed and can only be opened by the engagement of a ball as described above.

Arm **36** also carries control pin **52** which, when gate **20** is in closed position, contacts the rear side of switch lever **54** fulcrumed on hinge rod **24**. The free end of lever **54** projects over a suitable switch **56** held by bracket **58**. Bracket **58** is attached to bracket **26** and since each door **20** has its own control switch, and two doors are used to serve two adjacent alleys, bracket **58** serves as a common support for the two switches. Two sleeves or spacers **60** and **62** encircling rod **24** (Fig. 5), hold arm **36** and switch lever **54** in their proper operative positions thereon. A tension spring **64** wound around sleeve **60** having its ends, respectively, anchored to bracket **26** and hooked to arm **36**, is employed to urge door **20** to remain normally in closed position. Tension spring **66**, also anchored to bracket **26** and hooked to switch lever **54** (Fig. 5) tends to move lever **54** to actuate or depress switch **56**. However, so long as door **20** remains in closed position, switch lever **54** is held out of contact with switch **56** by control pin **52**.

A stop lug **68** projecting upwardly from the rear side of door **20** prevents door **20** from swinging outwardly from its proper closed position into pit P of the bowling alley.

In order to prevent door **20** from being opened accidentally by a moving cluster of pins or an irregularly bouncing ball, a latch arm **70** is provided. One end of arm **70** is pivotally supported on stud **72**; its other free end rests on a suitable bracket **74** on plate **30** (Fig. 4). A nose **76** extending downwardly from arm **70**, projects behind stop lug **68** of door member **20** and prevents the latter from being pushed open accidentally. Studs **72**, one for each latch arm **70** in the twin door installation illustrated, are mounted in a suitable common bracket **78** attached to a cross member **80** secured to plates **30**. Each latch arm **70** is connected by a link **82** to armature **84** of a solenoid **86** mounted on cross member **80**.

As mentioned heretofore, the drawings illustrate a pair of trap doors mounted between the kickbacks of two adjacent alleys so that one door serves the pit of alley A and the other door serves the pit of alley B. Each plate **30** is provided with a ball passage, such as a round opening **90** provided with an annular flange or frame **91** of a size sufficient to permit a bowling ball to pass therethrough.

Each door member **20** in normally closed position occupies the opening in the frame with its concave side facing the pit. The bottom of each pit is formed by an inclined, preferably continuously moving conveyor C which consists of an endless belt **92** supported by floor board **94**. Conveyor C runs over a pair of pulleys or rollers **96** driven from any suitable source of power. The pit of each alley also is provided with the customary cushion or backstop S.

On the bottom of the space between plates **30** is provided an inclined ball guide block **98** which is employed for the purpose of guiding a bowling ball delivered through an opening **90** from the pit of alley A or B, onto a suitably shaped track **100** which brings the ball into contact and engagement with a vertical belt ball lift L. As noted above, ball lift L may be of the same type and construction as that shown and described in the above referred to copending Holloway et al. application.

Ball lift L consists of an endless ball lifting conveyor **102** spaced from and coacting with the ball track **100**. Endless belt **102** runs on pulleys **104** and **106** rotatably supported in the upper and lower ends respectively of a support frame **108**. Upper pulley **104** is fixed to shaft **110** which is continuously driven by pulley **112** and belt **114** from a suitable source of power. Lower pulley **106** is rotatably mounted on stud shaft **116** supported in spaced arms of a fork **118** attached to rod **120** telescopically mounted in the tubular frame **108**. The upper portion of frame **108** is supported by means of a pair of links **122**, one end of each link being secured to an adjacent side of said tubular frame by a pin **124**; the other end of each link is pivotally connected to a flange of vertical U-shaped member **34** by means of stud **126**.

As illustrated in Figure 1, the top portion of each of the flanges of member **34** is beveled off in order to permit the upper portion of track **100** to be inclined outwardly and away from belt **102**. The lower portion of frame **108** is also supported by a pair of spaced links **128**. Each link **128** at one end is pivotally connected to fork portion **118**, the other end of each link **128** being pivotally connected to a flange of U-shaped member **34** by means of stud **130**. The provision of upper and lower links **122** and **128**, respectively, insures that frame **108**, by means of rotating pulleys **104** and **106**, will support conveyor belt **102** in proper operative relationship with track **100**. They also permit frame **108** and belt conveyor **102** to move upwardly whenever a ball is engaged and wedged by belt **102** at the ball receiving end and rolled thereby along track **100**. For proper positioning of belt conveyor **102** relative to the lower portion of track **100**, one of the upper links **122** rests on an adjustable stop screw **132** held by a suitable angle bracket **134** attached to one of the flanges of U-shaped member **34**.

The operation of trap doors **20** with two adjacent alleys is briefly as follows: When a ball is rolled by a player down either alley A or B, it lands upon continuously moving conveyor C in the pit of the respective alley A or B. The movement of conveyor C, as well as its inclined mounting, cause the ball to be moved to the rear of the pit where the ball is intercepted by the cushion or backstop S which is suspended from above in a convenient manner by a suitable framework (not shown). The cushion or backstop S is suspended in such manner as to form an angle of less than 90° with respect to plate **30** in which trap door **20** is mounted. This mounting

(Fig. 3), and the position or location of the backstop, cause the ball to be guided towards the trap door in plate 30 which, as mentioned before, forms one side wall of the pit.

In order to assure that the ball is properly guided to the center portion of the concave face of door 20, pit floor board 94 beneath the endless belt 92 of the conveyor C preferably is provided with a V-shaped cut-out (Figs. 1 and 3), the edges of which are beveled to form a transverse guide way 95 for the ball. The weight of the ball when reaching guide way 95, causes belt 94 to sink into guide way 95 in a trough-like fashion. The backstop upon intercepting a ball, prevents it from further rearward movement in the pit. It also causes the ball to be guided or delivered and positioned substantially centrally of the concave face of door 20, especially since conveyor C is not only inclined towards the rear of the pit, but also inclined towards that side of the pit which is formed by plate 30 in which trap door 20 is mounted.

As the ball is urged against the door member 20, it partly projects into the concave face thereof and, when properly located, simultaneously depresses both trip fingers or loops 46 of feeler rods 44 which extend outwardly through slots 48 of door 20. The preferred type of door 20 is generally circular. As shown in Figure 4, each door 20 has a central flat portion 21, such that when a ball engages it, as door 20 opens, the ball moves downwardly along flat portion 21 onto guide block 98 with a minimum of opening movement of door 20. Since feeler rods 44 are mounted on a swivel bracket 42 carried by rod 38 of arm 36, a simultaneous depression of trip fingers 46 causes arm 36 to move inwardly to the left, as viewed in Figure 4, when a ball is being ejected from alley B, under the pressure of the ball, in such a manner as to cause a disengagement of control pin 52 from switch lever 54. Then, due to the action of tension spring 66, lever 54 depresses the button of switch 56, thereby closing a contact in switch 56 (Fig. 2).

The closing of this contact completes a circuit from a suitable source of power through a suitable timer 140, a normally closed contact 142 of a relay 144, and through another relay 146 which causes the energization of the latter. When relay 146 is energized, the normally open contact 148 is closed, which in turn effects the energization of solenoid 86, and by its armature 84 through link 82, effects a raising of latch arm 70. This movement of latch arm 70 causes nose 76 to move out of engagement with stop lug 68 of door 20. Due to the fact that the ball is pressing against door 20, and the mass of the ball is greater than the mass of door 20, door 20 swings about hinge rod 24 into open position and the ball rolls through opening 90 onto inclined ball guide block 98, which guides it into contact with vertical belt ball lift L, which elevates it to ball return runway R. Since the operation of ball lift L is essentially the same as disclosed in the above mention copending Holloway et al. application, Serial Number 170,162, further description thereof is deemed unnecessary. As soon as the ball rolls onto guide block 98 and out of contact with the door member 20, tension spring 64, acting upon arm 36 and consequently upon rib 40 of door 20, causes the latter to close again and resume its normal operative position within the frame 91 of plate 30.

The closing of door 20 and the accompanying movement of arm 36, also cause a re-engagement of control pin 52 with switch lever 54 which disengages the latter from the spring loaded button of switch 56. This action interrupts the flow of current and causes relay 146 to drop out and open its contact 148 which in turn effects the de-energization of solenoid 86 and a lowering of latch arm 70 so that nose 76 thereof again drops in back of stop lug 68 of door member 20, and locks it against opening in any other manner except when another ball in the pit of alley B presses simultaneously against trip fingers 46 of feeler rods 44.

The swivel mounting of feeler rods 44 is provided for the purpose of preventing a door 20 from opening accidentally, which might be the case when a passing or flying pin strikes one of the loops 46. The construction and arrangement are such that if only one loop is depressed, the other simply swings outward with no effect upon arm 36.

The electrical timer 140 shown in the diagram in Fig. 2, is employed to prevent a trap door 20 from opening in case a ball bounces momentarily thereagainst. In such case, the ball is not positioned properly or ready to effect the movement of a door 20 to inoperative or "open" position. Hence in the illustrated embodiment, in order to open the door, a ball must engage and press against both trip fingers 46 simultaneously for a short period of time.

In an installation, such as shown in the accompanying drawings where one ball lift serves two adjacent alleys, an opening 90 and a door 20 are provided on one side of each pit for each alley, i. e. alley A and alley B, the openings 90 allowing balls to pass, when doors 20 are open, into the space between the kickbacks where said common ball lift is mounted.

Each door has its own switch 56, its own timer 140, its own relay 146 or 144, and its own solenoid 86 for operating its latch 70. However, in such installation, the control circuit serving the two doors is so arranged that only one door can be opened at a time thereby preventing jamming or striking together of two balls which would occur if they were allowed to move simultaneously from opposite pits. The arrangement is such that either relay 144 or 146 is energized while the other remains de-energized to permit flow of current through its normally closed contact to energize the other relay. As shown in Figure 2, relays 144 and 146 have a normally closed contact 142 and 150, respectively, and a normally open contact 152 and 148, respectively.

In the modified form of the invention illustrated in Figures 6 to 10 inclusive, a pair of doors or gates serve a common vertical ball lift L mounted on a cut-out between two kickbacks 32 of two adjacent alleys A and B. Since both doors are identical in design and construction, with the exception of being right hand and left hand, the description of one will serve for both. Door 160 consists of a generally circular body, substantially the same in construction as door 20 described hereinabove, and is provided with a concave surface 162 having a flat central portion 163 facing the pit of the alley.

On its rear side, door 160 is provided with a pair of hinge lugs 164 by means of which it is pivotally supported by a vertical hinge rod or shaft 166 supported by a suitable U-shaped bracket 168 attached to the cut-out edges of the two adjacent kickbacks 32. One bracket 168 is employed to support the two hinge rods for both doors. Around each hinge rod 166 is wound a tension spring 170 having one end anchored to supporting bracket 168 and the other end hooked to one of the hinge lugs 164. In this manner, spring 170 tends to keep the trap door 160 in closed position, or within an annular frame or flange 172 mounted on and reinforcing the edges of a suitable opening or ball passage 161 in plate 174. There are two plates 174 which form the rear extensions of kickbacks 32 and accordingly in the illustrated embodiment, constitute one of the side walls of each pit of the two bowling alleys.

Each door 160 is also provided with a stop lug 176 preferably formed integral with and projecting upwardly therefrom and serving as means for arresting door 160 when in closed position within annular frame 172. The body of door 160 also carries a latch mechanism designated generally E. This mechanism consists of a disc 178 secured to one end of short shaft 180 mounted in a bracket 190. Attached to the other end of shaft 180

is a crank arm 182 carrying a crank 184 (Figs. 9 and 10) to which is pivoted one end of a vertical plunger 186, the upper free end of which extends through a suitable slot 188 (Fig. 9) in bracket 190 pivotally supported by a vertical rod 192 mounted in suitable lugs 194 on the rear side of door 160.

A tension spring 196 having one end fixed to the rear side of door 160, and its other end hooked to bracket 190, acts to maintain disc 178 in a position where it partially projects through an elongated slot 198 in door 160. In this way part of disc 178 projects outwardly from the concave face of door 160 where it can be engaged by a ball to be removed from the pit of an alley. In order to provide positive locking means and to prevent either door of alley A or alley B from opening due to the action of a bouncing ball or flying pin, a lock arm 200 is so mounted as to reach behind the stop lugs 176 of both doors and physically prevent either door from opening until properly operated. Lock arm 200 is mounted pivotally at its center portion on stud 202 (Fig. 8) held by lug 204 suspended from and mounted on a suitable bridge bracket 206 fastened at each end to plates 174. In order to maintain a fine degree of balance of the scale like lock arm 200, there is provided a balance spring 208 having one end attached to a suitable bracket 210 and its other end anchored to the center portion of arm 200. Bracket 210 is secured to bridge bracket 206. Also attached to bracket 206 are a pair of lugs 212, each having pivotally mounted thereon a latch finger 214 (Fig. 8). The free end of each latch finger 214 engages with a pin 216 projecting from one side of each stop lug 176 of each door 160. The two latch fingers 214 are connected to each other by means of a suitable tension spring 218.

The pits of alleys A and B are equipped with the same type of inclined conveyor C as described previously. Floor board 94, supporting continuously running endless belt 92, is also provided with a V-shaped cut-out to form a transverse guide channel for directing the ball in the pit towards the trap door 160 in the opening of plate 174. The rear of each pit is also provided with a suspended cushion or backstop S mounted in such a manner as to form an angle of less than 90° with respect to plate 174 in which a trap door 160 is located. The bottom of the space between and below the two trap doors 160 mounted in the cut-out between the two kickbacks 32 of the two adjacent alleys A and B, is also provided with an inclined suitably shaped ball guide block 98 for the purpose of guiding a bowling ball rolling down the concave face of a door 160 as it passes through opening 161 onto a suitably shaped track 100 which brings the ball into contact and engagement with ball lift L briefly described heretofore and similar in construction and operation to that shown and described in patent application Serial Number 170,162 also mentioned above.

In use, the mechanism shown in Figs. 6, 7, 8, 9 and 10 operates as follows: As a ball lands in the pit of either alley A or B, the movement of conveyor C conveys it to the rear of the pit where it is intercepted by cushion or backstop S. As mentioned above, due to its mounting, together with the transverse V-shaped cut-out in the floor board of conveyor C, cushion S guides the ball towards and in front of trap door 160. The combination of the ball being more or less seated in the V-shaped cut-out, and at the same time held back by the cushion or backstop S while the endless belt 92 still travels in a rearward direction, imparts a rolling motion to the ball in front of the door. Since disc 178 projects through the concave face of door 160 at a spot close to the outer periphery thereof (Fig. 6), the rolling motion of said ball is imparted by frictional engagement to disc 178, because the ball is urged against said concave face and the disc offers resistance created by tension spring 196 acting upon frame 190 by which disc 178 is supported.

Any rotary motion imparted by the ball to disc 178 causes the latter to turn. This results in an upward movement of crank arm 182 and crank 184. An upward movement of the latter also causes an upward movement of the vertical plunger 186 which in turn engages with and raises that end of lock arm 200 which is adjacent to door 160 against which the ball applies its pressure. The lifting of the end of arm 200 causes the latter to move away from and out of the path of stop lug 176 of the respective door which, due to the pressure of the ball upon it, can now swing open and permit the ball to pass through frame 172 of opening 161 in plate 174 and roll downwardly along the face of now open door 160 and drop onto inclined ball guide block 98. The latter directs the ball onto track 100 where it contacts and engages with vertical belt ball lift L and is elevated thereby and delivered onto a suitable return runway.

When the end of lock arm 200 is lifted by the upward moving plunger 186, it is raised sufficiently high to allow a nose 215 (Fig. 10) of the adjacent latch finger 214 to move under the end of arm 200 and hold it in raised position until the door after admitting and losing contact with the ball, closes again. As mentioned heretofore, latch fingers 214 are provided with a tension spring 218 which urges each finger 214 inwardly after each door is opened and its free end has disengaged with pin 216 on stop lug 176 of the respective door. As each door 160 closes again under the action of tension spring 170, pin 216 engages the free end of latch finger 214. This effects a withdrawal of nose 215 from the under side of the raised end of lock arm 200 which, due to the action of spring 208, snaps back to its normal locking position shown in Figs. 8 and 10.

In order to achieve proper lifting action of vertical plunger 186 and prevent crank 184 from being turned more than one-half revolution, crank arm 182 is provided with a stop lug 183, which, after approximately one-half a revolution, contacts the rear side of the door, and the plunger with the ball turning against the disc is kept in raised position long enough to effect the latching of lock arm 200 just described. A tension spring 187, anchored at one end to frame 190 and having its other end hooked to plunger 186, returns the latter as well as crank 184 to their lowermost position after the door opens and disc 178 loses contact with the ball.

It is also a feature of this arrangement that only one door can be actuated at a time, and the tension springs 187 may be so selected as to their stiffness and action to create a delaying action in case a ball arrives at each door at exactly the same time. In this way the softer of the two springs 187, will yield first under the pressure of a ball.

The invention above described may be varied in construction within the scope of the claims, for the particular device, selected to illustrate the invention, is but one of many possible concrete embodiments of the same. It is not, therefore, to be restricted to the precise details of the structure shown and described.

What we claim is:

1. Bowling ball handling and return apparatus for use with two adjacent bowling alleys, each of said alleys having a kickback at one end of said alley provided with a ball opening, a ball return runway, a ball receiving device located between said kickbacks and adapted to receive balls in succession passing through said openings, means for operating said device for delivering balls onto said runway, a movable door for each of said kickbacks, lock means for each of said doors normally securing each of said doors in operative position closing said openings, and ball operated unlocking means for selectively unlocking one only of said lock means of said doors for movement of a ball therepast and through said opening corresponding to said one of said doors to said device.

2. Bowling ball handling and return mechanism for use with two side by side bowling alleys, each having a pit at one end, and kickbacks at opposite sides of said pits,

one of said kickbacks of each of said alleys being spaced from the kickback of the other of said alleys, and provided with a ball opening, a gate normally closing each of said openings, a separate latch securing each of said gates against opening, a ball actuated latch trip for each of said latches, and means in said pits for directing balls against said trips for selectively unlatching said latches, whereby a ball may open a selectively operated gate and move through said opening out of the pit with which said gate is associated, means for returning each of said gates to latched position after a ball has passed through said opening and a ball return adjacent said opening positioned to receive a ball passing therethrough.

3. Bowling ball handling and return apparatus for use with two adjacent bowling alleys, each of said alleys having a pit, kickbacks at opposite sides of said pit, and wherein two adjacent kickbacks are spaced from each other a distance greater than the diameter of a bowling ball, and each of said last-named kickbacks is provided with a ball opening, a ball return device positioned in said space between said last-named kickbacks adapted to receive alternate balls delivered through a selected opening, a door for each of said openings, supports mounting each door for movement to and from opening and closing position relative to said opening, latch mechanism for securing each of said doors, said mechanism including spaced trip fingers extending through said doors and into said pits, and selectively operated unlatching mechanism operated by said fingers in response to the engagement of a ball with said fingers for unlocking the latch mechanism associated with said fingers engaged by said ball whereby said door may move to open said opening for movement of a ball therethrough and out of one of said pits.

4. The apparatus defined in claim 3 wherein said unlatching mechanism includes a solenoid for each of said doors connected to said latch, an operating circuit including the coil of said solenoids, a movable mount for said trip fingers, an arm supporting each of said mounts, an actuating member on said arm, a switch engaged by said member, and means operative in response to the engagement of said fingers by a ball in one or the other of said pits for moving said arm and member operatively connected to said trip fingers of said selected door to actuate said switch and close said circuit, whereby said soleonid moves said latch out of latching position.

5. Bowling ball handling and return apparatus for use with a bowling alley having a pit, kickbacks at opposite sides of said pit, one of said kickbacks being provided with a ball opening, a ball return device positioned to receive a ball delivered from said pit and through said opening, a gate, supports mounting said gate for movement to and from opening and closing position relative to said opening, a latch for securing said gate in operative position closing said opening, a latch trip projecting outwardly from said gate into said pit, said trip including a rotatable ball operated disc, a latch trip rod operated by said disc, and means for directing a ball in said pit into rotary engagement with said disc to rotate said disc to move said latch trip into engagement with said latch to unlatch said gate, whereby said gate is moved by said ball to open said opening for movement of said ball therethrough and out of said pit.

6. Bowling ball handling and return apparatus for use with a bowling alley having a pit, kickbacks at opposite sides of said pit, one of said kickbacks being provided with a ball passage, a ball return device positioned to receive a ball delivered through said passage, a door, supports mounting said door for movement to and from opening and closing position relative to said passage, latch mechanism for securing said door, spaced trip fingers extending through said door and into said pit, unlatching mechanism operated by said fingers and operative in response to the simultaneous engagement of each of said fingers by said ball for unlocking said latch mechanism, and means for guiding a ball in said pit into engagement with said fingers whereby said door may move to open said passage for movement of a ball therethrough and out of said pit.

7. Bowling ball handling and return apparatus for use with a bowling alley, a kickback at one end of said alley having a ball opening through which a ball may move out of said alley, a ball return runway, a device for delivering a ball onto said runway, a door adapted to close said opening, lock means normally securing said door in operative position closing said opening, ball operated unlocking means operative in response to the pressure of a ball in said pit thereagainst for unlocking said lock means of said door for movement of a ball through said opening to said device, and means in said pit for locating a ball in position to actuate said unlocking means.

8. Bowling ball handling and return apparatus for use with a bowling alley having a pit, kickbacks at opposite sides of said pit, one of said kickbacks being provided with a ball opening, a ball return device positioned to receive a ball delivered through said opening, a door, supports mounting said door for movement to and from opening and closing position relative to said opening, latch mechanism for securing said door including a latch, a latch trip rod, a rotatable friction member connected to said trip rod for moving said trip rod into engagement with said latch to unlatch said door, means mounting said member to extend outwardly through said door and into said pit, means in said pit for positioning a ball in engagement with said member, and means for rotating said ball while in engagement with said member for rotating said member and moving said trip rod into engagement with said latch for unlocking said door, whereby said door may move to open said opening for movement of a ball therethrough and out of said pit.

9. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, an alley kickback having a ball opening through which a ball may move out of said pit, a gate, supports mounting said gate for movement into and out of closing position in said opening, means connected to said gate tending to maintain said gate in closed position, the mass of said gate and the force exerted by said last-named means being less than the mass of a bowling ball, lock means securing said gate in closing position in said opening, ball actuated trip mechanism operative in response to the pressure of a ball thereagainst for unlocking said means for passage of a ball through said opening, and conveying means in said pit for directing a ball into operative pressing engagement with said mechanism for unlocking said means, the mass of said ball forcing said unlocked gate out of said opening for passage of said ball therethrough.

10. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, an alley kickback having a ball opening through which a ball may roll out of said pit, a gate adapted to close said opening, lock means securing said gate in closing position to prevent uncontrolled movement of a ball through said opening, and ball actuated mechanism for unlocking said lock means solely in response to the engagement of a ball therewith to open said gate for passage of a ball out of said pit and through said opening, and means for delivering said ball onto a ball return runway.

11. Bowling ball handling and return apparatus for use with a bowling alley, a kickback at one end of said alley having a ball opening through which a ball may roll from said alley, a ball return runway, a device for delivering a ball rolling through said opening onto said runway, a movable gate, lock means normally securing said gate in locked position closing said opening to prevent uncontrolled movement of a ball therethrough, and ball operated unlocking means on said gate operative in response to the pressure exerted thereon by a ball for unlocking said lock means and releasing said gate for movement of a ball therethrough to said device.

12. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, kickbacks at opposite sides of said pit, one of said kickbacks being provided with a ball opening through which a ball may roll out of said pit, a gate normally closing said opening, a latch securing said gate against opening, a ball actuated latch trip for said gate, means in said pit for directing a ball against said trip for unlatching said latch in response to the pressure of said ball against said trip, whereby said ball forces said unlatched gate open and moves through said opening out of said pit, a ball return adapted to receive said ball, and means for returning said gate to latched position after said ball has passed through said opening.

13. Bowling ball handling and return apparatus for use with a bowling alley having a pit, kickbacks at opposite sides of said pit, one of said kickbacks being provided with a ball passage through which balls roll out of said pit, a ball return device positioned to receive a ball delivered from said pit and through said passage, a gate, supports mounting said gate for movement to and from opening and closing position relative to said passage, latch mechanism for securing said gate in operative position closing said passage, a ball operated latch trip projecting outwardly from said gate into said pit, and means actuated by a ball in response to its engagement with said trip for unlocking said latch mechanism to release said gate for opening under the pressure of said ball, whereby said gate is moved from passage closing position by said ball to open said passage for movement of said ball therethrough and out of said pit.

14. The apparatus defined in claim 12, wherein said latch trip includes trip fingers extending through said gate and into said pit, and unlatching mechanism operative in response to the engagement of said fingers by said ball for unlocking said latch, whereby said gate may move out of said opening for movement of a ball therethrough and out of said pit.

15. The apparatus defined in claim 14, wherein said gate unlatching mechanism includes a movable mount for said trip fingers, a pivot shaft for said gate, an arm pivotally mounted on said shaft, a shaft on said arm supporting said movable mount, and an actuating member on said arm.

16. The apparatus defined in claim 14, wherein said unlatching mechanism includes a solenoid connected to said latch, an operating circuit including the coil of said solenoid, a movable mount for said trip fingers, a movable arm supporting said mount, an actuating member on said arm, a switch engaged by said member, and means operative in response to said engagement of said fingers by a ball for moving said arm and member to actuate said switch and close said circuit to energize said solenoid and move said latch out of latching position.

17. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, a kickback at one end of said alley adjacent said pit having a ball opening through which a ball may move out of the pit of said alley, a ball return runway, a device for delivering a ball onto said runway, a door adapted to close said opening, lock means normally securing said door in operative position closing said opening, and ball operated unlocking means including a trip operating element extending through said door operative in response to the engagement by a ball in said pit for unlocking said door, the pressure of said ball against said door moving said unlocked door to open position for movement of said ball through said opening onto said device.

18. Bowling ball handling and return mechanism for use with a bowling alley having a pit at one end, kickbacks at opposite sides of said pit, one of said kickbacks being provided with a ball opening through which a ball may move out of said pit, a gate normally closing said opening, a latch securing said gate against opening, a ball actuated latch trip projecting through an opening in said gate into said pit, means in said pit for directing a ball against said trip for unlatching said latch in response to the pressure of said ball against said trip, whereby said ball forces said unlatched gate open and moves through said opening out of said pit, a ball return adapted to receive said ball, and means for returning said gate to latched position after said ball has passed through said opening.

19. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, an alley kickback having a ball opening through which a ball may move out of said pit, a gate, lock means securing said gate in closing position relative to said opening, a ball actuated mechanism for unlocking said lock means, said mechanism including an actuating device, said actuating device including a member operative in response to the pressure of a ball thereagainst for operating said mechanism to unlock said gate for passage of a ball through said opening, means in said pit for directing a ball into operative engagement with said mechanism, and a ball return positioned to receive a ball moving through said opening.

20. Bowling ball handling and return apparatus for use with two adjacent bowling alleys, each of said alleys having a pit at one end, and alley kickbacks at the sides of said pits, the adjacent kickbacks of each of said alleys being spaced from each other, and provided with a ball opening, a gate adapted to close said opening, lock means for each of said gates securing each of said gates in closing position in said opening, ball actuated control mechanism for selectively unlocking a selected lock means to open the gate corresponding to said selected lock means for passage of a ball out of the pit corresponding to said gate and through said opening, and a ball return positioned to receive balls moving through said openings out of said pits.

21. Bowling ball handling and return mechanism including a ball return for use with a bowling alley having a pit at one end, kickbacks at opposite sides of said pit, one of said kickbacks being provided with a ball opening, a gate normally closing said opening, a latch securing said gate against opening, a ball actuated latch trip for said gate including an operating member, means in said pit for directing a ball into operative association with said member, whereby said ball actuates said member to disengage said latch and forces said gate open and moves through said opening out of said pit for delivery to said ball return, and means for returning said gate to latched position after said ball has passed through said opening.

22. Bowling ball handling and return apparatus for use with two adjacent bowling alleys, each of said alleys having a pit at one end, and alley kickbacks at the sides of said pits, the adjacent kickbacks of each of said alleys being spaced from each other, and each being provided with a ball opening, a gate adapted to close each of said openings, lock means securing each of said gates in closing position, said lock means including ball actuated control mechanism operative in response to the engagement of a ball therewith for selectively unlocking a selected lock means to unlock only one of said gates at a time for unobstructed passage of a ball out of the pit associated with the unlocked gate and through a selected opening, means maintaining the other of said gates locked during the movement of a ball through the opening associated with said unlocked gate, means in said pits for positioning balls in operative engagement with said control mechanism, and ball return means adapted to receive balls moving outwardly from said pits through said openings.

23. Bowling ball handling and return apparatus for use with two adjacent bowling alleys, each of said alleys having a pit, kickbacks at opposite sides of said pits, and wherein two adjacent kickbacks are spaced from each other a distance greater than the diameter of a bowling ball, and each of said last-named kickbacks is provided with a ball passage, a ball return device positioned in said space between said last-named kickbacks adapted to receive alternate balls delivered through said passages, a

door for each of said passages, supports mounting said doors for movement to and from opening and closing position relative to said passage, latch mechanism for securing said doors, a friction operated unlatching member for each of said doors, selectively operated unlatching mechanism operated by one of said members in response to pressure exerted thereon by a ball in the pit corresponding to said member for tripping the latch mechanism associated with said member, and means in each of said pits for positioning a ball to operate its respective member, whereby the respective door unlatched thereby may move to open said passage for movement of a ball therethrough and out of said one of said pits to said return device.

References Cited in the file of this patent

UNITED STATES PATENTS

904,400	Brenneman	Nov. 17, 1908
990,296	Roth	Apr. 25, 1911
1,375,835	Fairchild	Apr. 26, 1921
2,019,607	Hedenskoog	Nov. 5, 1935
2,388,707	Rundell	Nov. 13, 1945
2,470,052	Rundell et al.	May 10, 1949
2,566,379	Strong	Sept. 4, 1951
2,600,918	Pohl	June 17, 1952
2,682,404	Lund	June 29, 1954