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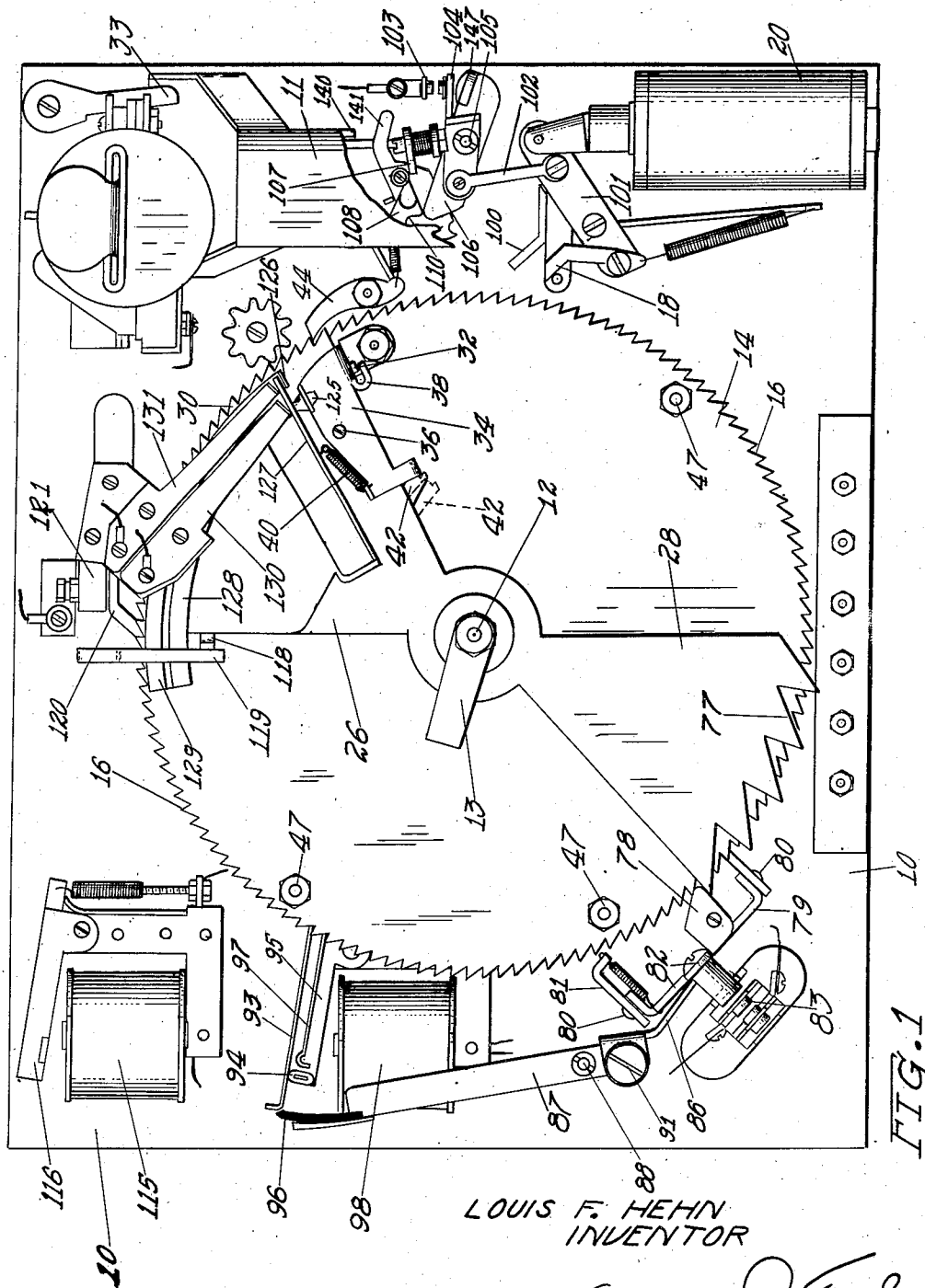
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2,118,303

COIN CONTROL FOR BOWLING ALLEYS

Filed April 9, 1934

6 Sheets-Sheet 1



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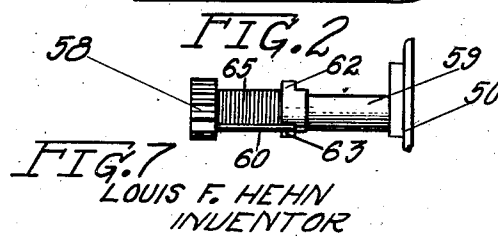
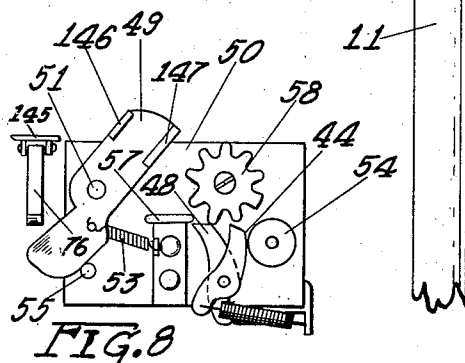
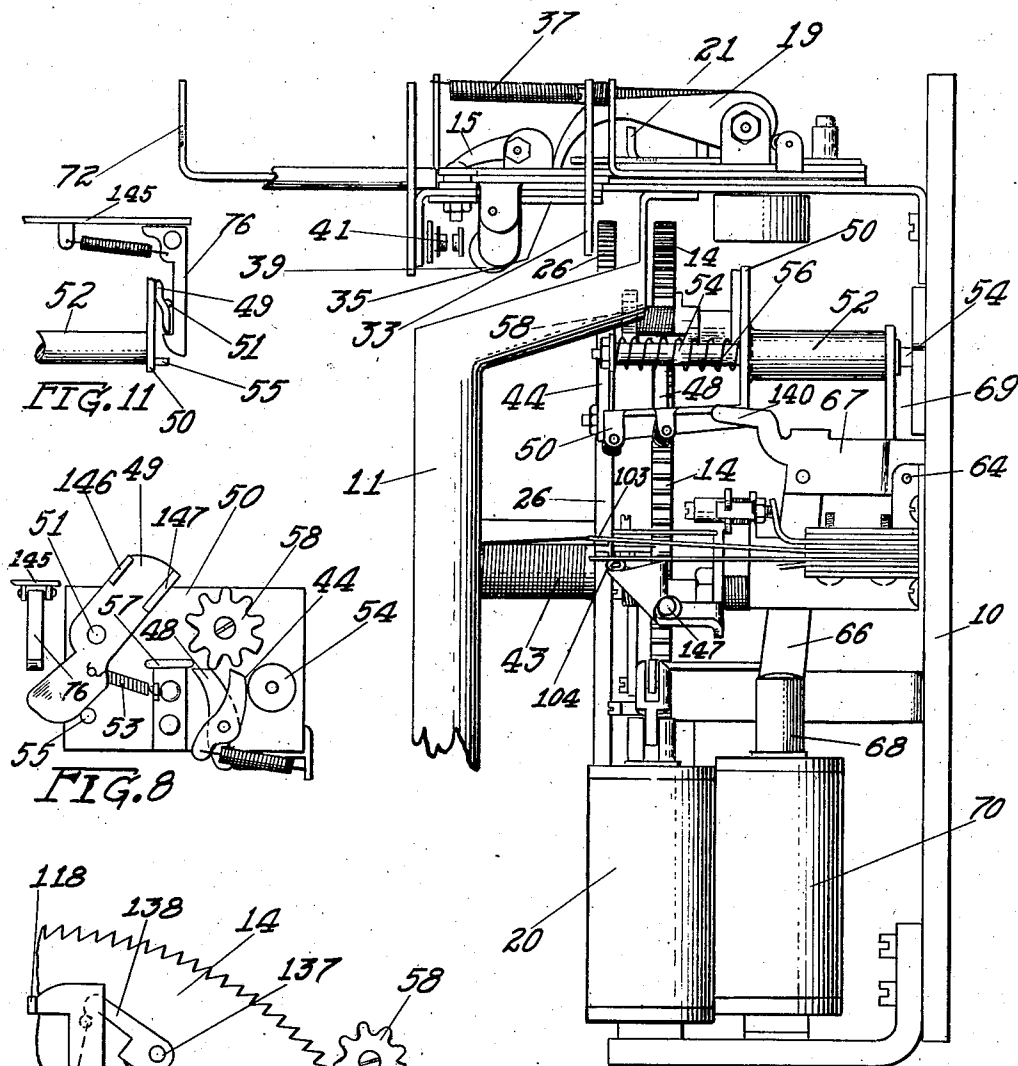
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6 Sheets-Sheet 3

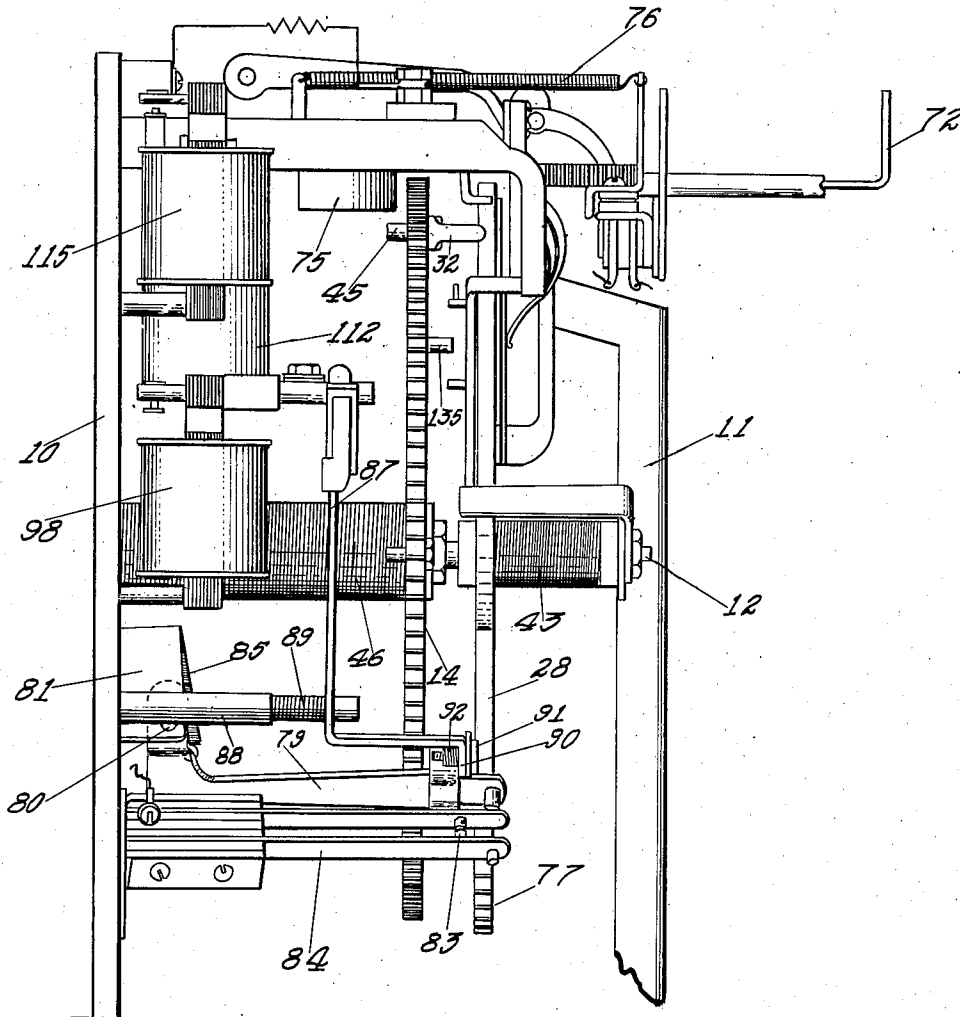


FIG. 3

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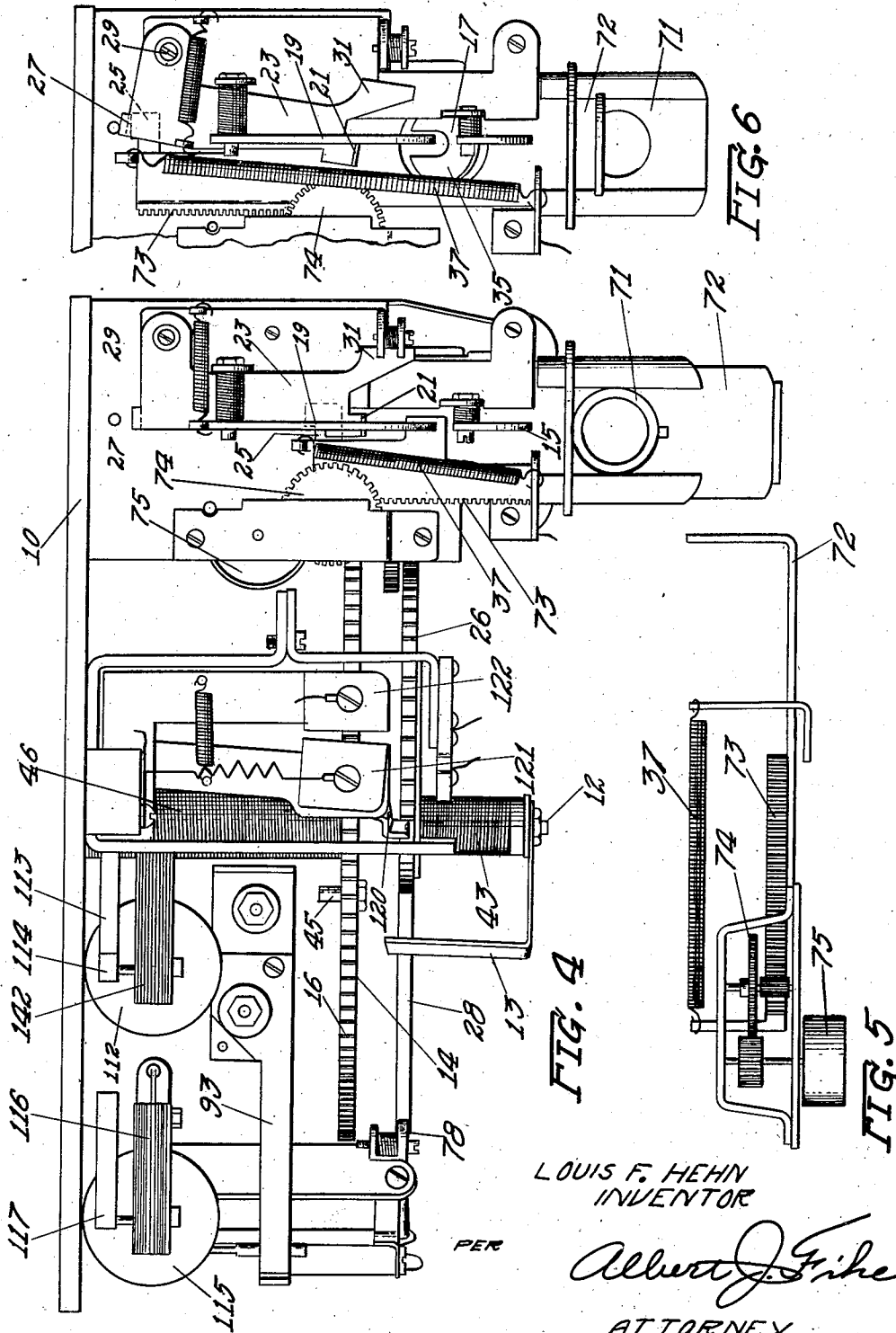
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COIN CONTROL FOR BOWLING ALLEYS

Filed April 9, 1934

6 Sheets-Sheet 4



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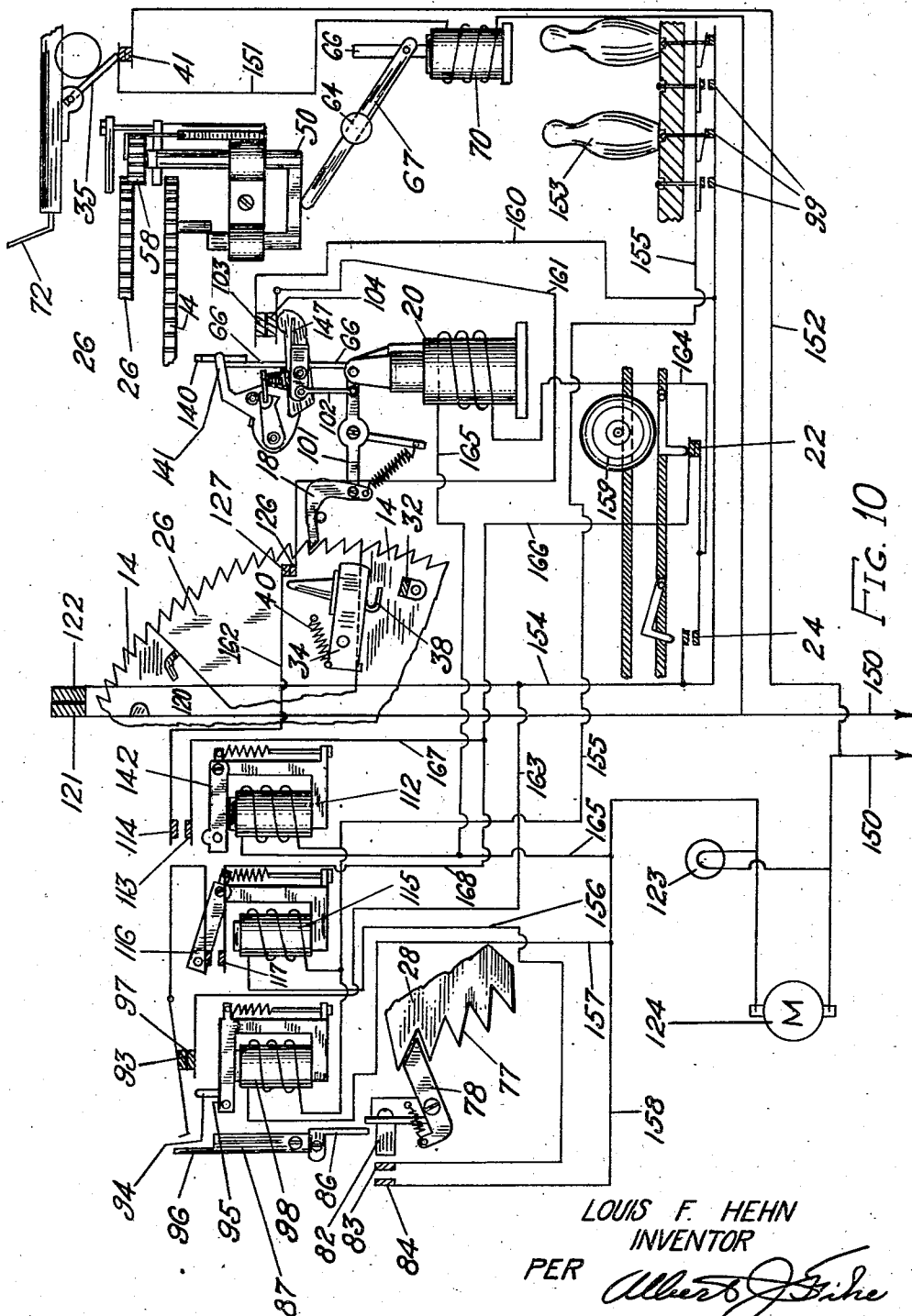
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2,118,303

COIN CONTROL FOR BOWLING ALLEYS

Filed April 9, 1934

6 Sheets-Sheet 5



May 24, 1938.

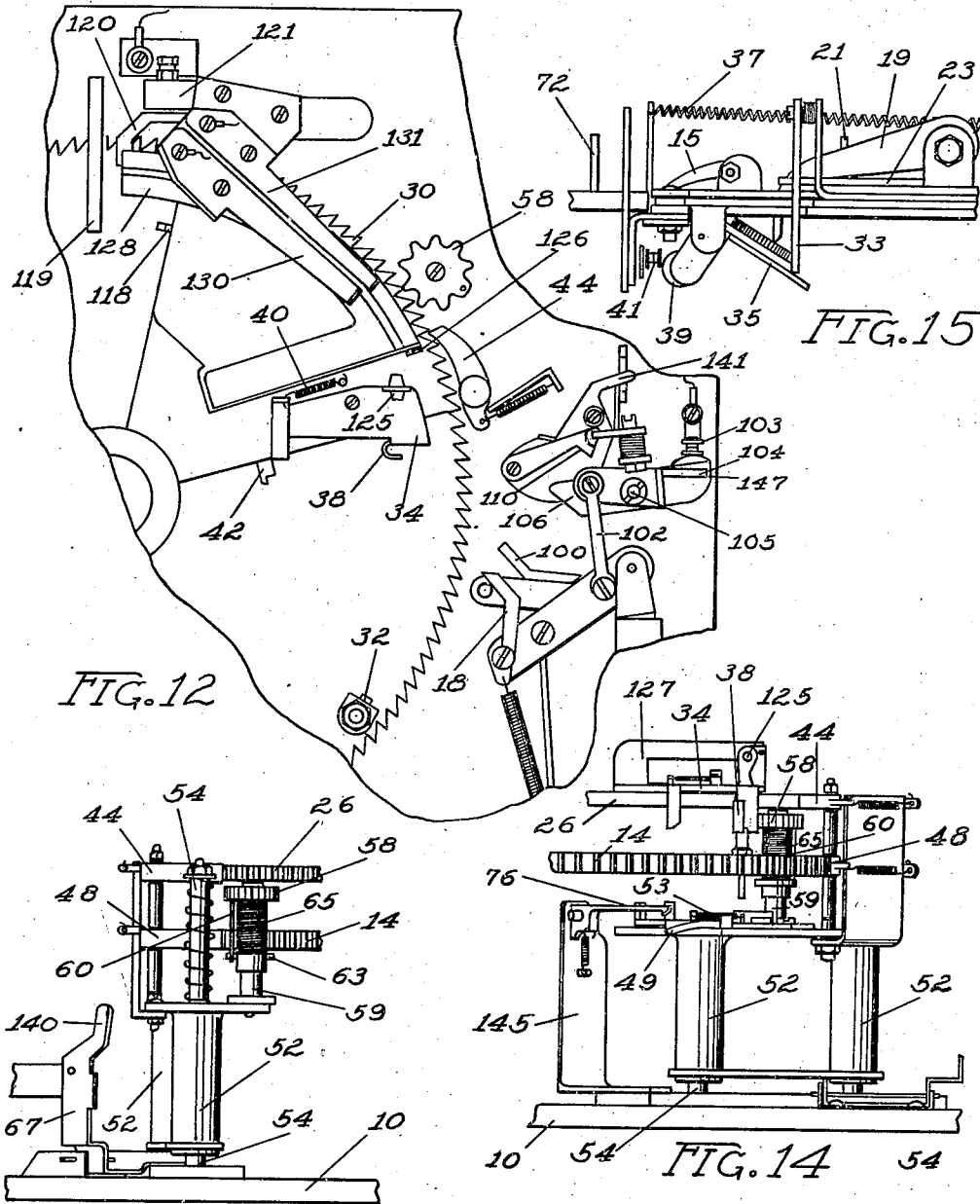
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COIN CONTROL FOR BOWLING ALLEYS

Filed April 9, 1934

6 Sheets-Sheet 6



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2,118,303

COIN CONTROL FOR BOWLING ALLEYS

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Application April 9, 1934, Serial No. 719,688

18 Claims. (Cl. 194—58)

This invention relates to an improved coin-operated control for bowling alleys and has for one of its principal objects, the provision of a device whereby play on a bowling alley will be permitted upon the insertion of a coin into such an apparatus connected with the alley, and whereby play will be automatically indicated as terminated after the bowler has completed the usual ten frames regardless of the number of balls thrown by the bowler.

One of the important objects of this invention is to provide a coin-controlled attachment for bowling alleys which will enable any number of players from one to five inclusive to bowl on an alley in regular rotation or otherwise, this play being permitted by the insertion of a required number of coins into the device corresponding to the number of players desiring to participate.

Another important object of the invention resides in the provision of means, in an automatic coin control for bowling alleys, whereby play will be automatically indicated as stopped after all the players have completed their allotted ten frames regardless of the number of balls used, this depending upon the number of strikes, spares and other scores made.

Still another object of the invention is to provide an automatic coin control for bowling alleys whereby the players will be automatically notified when the alley is ready for action and will also be automatically notified after play is terminated according to the rules.

Another and still further important object of the invention resides in the provision of a coin control attachment for bowling alleys which may be used with equally good results on alleys where pin boys are employed and also on alleys where the setting of the pins and the return of the balls is automatic or semi-automatic. The device will operate equally as well with bowling alleys employing what is known as tethered pins and also the ordinary ten-pins, duck-pins or the like, regardless of size.

The apparatus may also be employed with miniature bowling alleys and with slight adaptations may be used with other games and for other purposes.

Other and further important objects of this invention will be apparent from the accompanying drawings and following specification.

The invention, in a preferred form, is herein-after more fully described.

In the drawings:

Figure 1 is a front elevation of the improved coin control for bowling alleys of this invention.

Figure 2 is a right-hand end view of the same.

Figure 3 is a left-hand end view.

Figure 4 is a top view of the device.

Figure 5 is a side elevation of certain portions of the coin control shown in Figure 4.

Figure 6 is a detail view of a portion of the coin control shown in another position from that illustrated in Figure 4.

Figure 7 is a detail view of a portion of the regulating release mechanism for the control wheel.

Figure 8 is a detail end view of this control mechanism.

Figure 9 is a detail view of a locking device for the control mechanism, showing the same in its relationship to the control wheel.

Figure 10 is a diagrammatic view illustrating the wiring connections.

Figure 11 is a detail view of a means for preventing rebound of the control wheels.

Figure 12 is a partial view of the apparatus shown in Figure 1, but illustrating the control wheel and its appurtenances in a different position.

Figure 13 is a side elevation in more detail of a portion of the apparatus shown in Figure 2 illustrating more particularly the release mechanism for the control wheel.

Figure 14 is a bottom view of this release mechanism, also showing part of the control wheel and some of its appurtenances.

Figure 15 is a detail side view of the coin control mechanism somewhat similar to that shown in Figure 1, but illustrating the same in the position of Figure 6.

As shown in the drawings:

The reference numeral 10 indicates generally the supporting plate for the improved coin control apparatus of this invention, the same having a pin 12 positioned centrally thereof and projecting forwardly therefrom as best shown in Figures 1, 3, and 4.

Upon this pin 12 is rotatably mounted a control wheel 14, the same being provided with teeth 16 extending around its periphery, the teeth 16 being one hundred and five in number, and thereby making provision for the playing of a maximum number of twenty-one balls each by a number of players ranging from one to five inclusive.

The toothed wheel 14 is adapted to be rotated about the shaft 12 in a counter-clockwise direction when viewed as shown in Figure 1 by means of a pawl 18, which pawl is operated by means of a relay 20, this relay being set into operation by

means of electrical contact elements in the ball return way and which contacts are closed whenever a ball is returned to the bowler via the run-way.

There are two of these contacts in the runway, one being indicated at 22 in Figure 10 and the other at 24.

Were each player to use a predetermined number of balls in bowling against ten frames, the problem of automatic coin control would be quite simple, but on account of the rules of bowling and also on account of the various possibilities of play, the number of balls used by a player in bowling against ten frames may vary from a minimum of twelve to a maximum of twenty-one.

In the game of duck pins, as sometimes played, the maximum number of balls rolled may be thirty, and the machine of this invention can be readily made to handle this contingency.

In order to accommodate the control means to these various exigencies, a supplementary control element comprising a sectional gear 26, (Figure 1) is also rotatably and independently mounted on the shaft 12 adjacent the main control wheel 14 and having a diametrically opposite extension 28 which is for the purpose of preliminarily setting the device to accommodate any desired number of players from one to five inclusive.

The segmental gear 26 is provided with fifteen peripheral teeth 30 of the same size as the teeth 16 on the main control wheel 14, and this segmental gear is moved in a counter-clockwise direction at predetermined times along with the main control wheel 14 by means of a pusher pin 32 positioned on the main control wheel and which, at predetermined times, contacts a combined pushing and locking element 34 pivotally mounted on the sectional gear 26.

This combined pushing and locking element 34 is pivotally mounted at 36 on the segmental gear 26 and includes an inwardly turned hook element 38 into which the pin 32 rides when approaching the segmental gear 26. The plate 34 with its hook 38 is normally held in a retracted position to receive the pin 32 by means of a spring 40, and as soon as the pin 32 contacts the hook 38, it moves the plate 34 about the pivot point 36 against the tension of the spring 40 until such time as the over-hanging edge of the hook 38 has contacted the edge of the segment 26. When this occurs, a spring-impelled latch 42 pivotally mounted on the under-face of the segment 26 fits under a corresponding extension of the plate 34, (Figures 1 and 9) thereby locking the plate 34 in this position and preventing the pin 32 from moving out of the hook 38. This action locks the segment 26 to the main wheel 14 and causes them to move together from that time on.

A pawl 44 is also provided adapted to ride in the teeth 30 of the segmental gear 26 whereby undesirable retroactive movement of both the wheel 14 and the segment 26 is prevented until such time as this pawl is released.

After the segment 26 has been thus locked into position to move along with the main wheel 14, further operation of the pawl 18 causes both these elements to move along together until such time as an outwardly turned extension 118 on the end of the lever 42 contacts a stop 119 (Figure 1), whereupon the latch 42 is again moved to the dotted line position shown in Figure 1, releasing the correspondingly in-turned locking end of the plate 34. This marks the end of the counter-

clockwise movement of the entire mechanism and correspondingly indicates the end of play, after which the insertion of additional coins into the device is necessary before play can be resumed.

At about the same time that the pin 32 is entering the hook 38, another pin 135 on the main control wheel 14 is riding over the cammed face of an element 136 (Figure 9), which element is pivotally mounted at 137 to the rear face of the segment 26. This cam action pushes a hook element 138 on the further end of the lever 136 upwardly, allowing a locking pin 139 which is fastened on the element 42 to ride out from under the hook 138, accordingly permitting movement of the end of the latch 42 into the full line position shown in Figure 1, thereby allowing the locking relationship between the segment 26 and the control wheel 14 heretofore described.

While the control wheel 14 is being moved in a counter-clockwise direction by the action of the pawl 18, it operates to tension a helical spring 46 (Figures 3 and 4) connected therewith and with the plate 10 and positioned about the shaft 12, and the tension of this spring thereupon acts to return the control wheel to its normal original position upon release of a locking pawl 48 (Figures 2, 8, and 9) which acts against the control wheel 14 in a manner similar to the action of the pawl 44 against the segmental gear 26.

These two pawls 44 and 48 are both pivotally mounted on a carriage 50 which carriage includes a pair of sleeves 52 slidably mounted on shafts 54 and spring-pressed into normal retracted position by means of a spring 56.

Also mounted on the carriage 50—52 is a pinion 58 which goes into mesh with the teeth on the segment 26 when the carriage 50—52 is pushed to the left as shown in Figure 2, which movement at the same time releases the pawls 44 and 48 from contact with their respective toothed wheels 26 and 14.

As best shown in Figure 7, the pinion 58 is mounted on a shaft 59 and is provided with a rearwardly extending pin 60 which operates against a stop 62 which stop is so positioned with regard to the pinion 58 that the same is allowed a maximum rotation of only three teeth upon being meshed with the teeth of the segmental gear 26 after the substantially simultaneous release of the pawls 44 and 48 contingent upon the outward shifting movement of the carriage 50—52. The pinion 58 with its pin 60 is normally retracted against a stop 63 by a spring 65 on the shaft 59.

This outward shifting movement of the carriage 50—52 is accomplished by means of an offset bell crank lever 67—69 pivoted at 64 (Figure 2) and which is pivotally connected adjacent its forward end to a link 66, this link, in turn, being pivotally mounted on the upper end of the armature 68 of a control magnet or relay 70.

This relay 70 is directly connected to the coin-control and is operated every time an individual coin is inserted into a coin opening 71 and the operating lever 72 pushed inwardly. (Figures 4 and 6.)

The coin-control mechanism includes, besides the opening 71 in the slide 72, a pivoted guard 15 (Figure 2) which is for the double purpose of preventing operation without a coin and also to prevent operation of the device by means of metal washers. This pivoted guard 15 drops into the opening 71 upon inward motion of the slide 72 in the event that there is no coin in the opening or if the same contains a washer having

a hole therein, thereby preventing further inward movement of the slide. If desired, a magnet may be provided adjacent the slide and opening for automatically throwing out iron or steel slugs.

5 In the event that there is a coin of the desired denomination in the opening 71, the guard 15 allows the slide and coin to move inwardly until such time as the slot with the contained coin comes directly over a corresponding opening 17
10 in the plate beneath the slide 72 whereby the coin is forcibly pushed downwardly by means of a spring-pressed finger 19 which is released for this purpose by reason of the fact that a support
15 21 which forms an extension of a pivoted plate 23 rides out from under the finger 19, this action being caused by a trip element 25 integral with the slide 72, and which, at the end of the inward motion of the slide 72, contacts with a downward
20 extension 27 of the plate 23, thereupon moving the same about its pivot point 29 whereby the support 21 is shifted sidewise.

This sidewise motion of the plate 23 also moves the further integral extension 31 thereof away from contact with a spring-pressed latch 33 (Figure 1), which latch 33 then rides inwardly into
25 operative contact with a coin shelf 35, (Figure 2) which coin shelf has been depressed by the action of the finger 19 pushing against a coin thereon, and the latch 33 operates to hold this shelf in such depressed position until the slide 72
30 has had an opportunity to be returned to normal outward position by action of its spring 37.

In order to allow sufficient time for operation of the various parts between successive insertions
35 of coins, a speed governing mechanism is attached to the slide 72, (Figure 5) this being in the form of a rack 73 fixed on the slide, which rack is in mesh with a pinion on a gear 74, the gear, in turn, driving a speed governor 75 of any
40 approved or conventional design. The liberated coin drops into a chute 11.

Depression of the coin shelf 35 also operates a cam 39 which is integral therewith (Figure 2) which cam acts to accordingly close the contacts
45 41 of an electric switch. This switch is also shown in Figure 10 as connected to the magnet 70. Therefore, each time a coin is placed in the device and the slide 72 operated, the magnet 70 is electrically connected to a source of current,
50 and this, through the bell-crank lever 67-69, moves the carriage 50 outwardly, allowing the segment 26 to shift clockwise for a distance corresponding to three of its teeth. A spring 43 is tensioned upon the counter-clockwise rotation of the segment 26, thereby tending to return it to
55 its original position upon such release, and a stop 13 prevents movement beyond a certain predetermined point.

At the same time that the segment 26 is thus released for a clockwise movement, the main control wheel 14 is also released on account of the
60 fact that its pawl 48 rides out of engagement with the teeth 16 on this wheel when the carriage 50-52 is shifted to the left. The control wheel 14 is provided on its rear face with five pins 45 held in position by means of nuts 47 and spaced
65 equi-distantly apart, the space between each of the pins corresponding to twenty-one of the teeth 16. The wheel 14 being, therefore, free to move, it is rotated in a clockwise direction by means of
70 the tension of its spring 46, and this motion continues until one of the pins 45 contacts a receiving slot formed in a stop element 49 mounted on the carriage 50 as best shown in Figure 8, the carriage 50 being then in its forward position.

75 This stop element is pivotally mounted on the

carriage 50 at 51 and is held in position to receive any one of the pins 45 by means of a spring 53 and a stop pin 55 which operates against an extension of the element 49. A cushion 57 is
5 fixed in a holder on the carriage 50 so as to eliminate undue noise in this operation.

A latch 76 is pivotally mounted on a bracket 145 which bracket is fixed on the plate 10, and this latch 76 is mounted adjacent the cammed lower end of the pivoted locking element 49 for
10 the main control wheel 14 (Figure 11). The lower end of the latch 76 is also cammed so as to readily ride over the correspondingly curved face of the lower end of the element 49, this occurring
15 whenever one of the locking pins 45 on the control wheel 14 fits into the slotted upper end of the element 49 and tilts it about its pivot 51 into position with the bumper 57. (Figure 8.) The latch 76 then assumes the position shown in Figure
20 11, locking the element 49 in position against the bumper or stop 57 and retaining the pin 45 between the two extensions 146 and 147 on the element 49. This prevents either backward or forward movement of the wheel 14 until such
25 time as the carriage 50-52 is released by the de-energizing of the magnet 70, whereupon the element 49 moves rearwardly out of engagement with the pin 45, and also out of engagement with the latch 76, thereby allowing this element 49 to resume its normal position as indicated in
30 Figure 8, and permitting a further movement either backward or forward of the wheel 14, depending upon whether play is begun or whether still another coin is inserted into the device to provide for an additional player.

It will thus be seen that the control wheel 14 is allowed to move in a clockwise direction for a space of twenty-one teeth every time a coin is inserted in the mechanism, and at the same time, the segment 26 is allowed to move in a clockwise
40 direction for a space of three teeth. Obviously, if five coins are inserted, the wheel 14 makes a complete revolution and the segment 26 moves the entire limit of its possible shifting motion of fifteen teeth, and if any intermediate number of coins is inserted, a correspondingly intermediate
45 movement takes place. While the segment 26 is thus moving clockwise, its complimentary segment 28 with five large teeth 77 thereon (Figure 1) is moving with it, and the teeth 77 will, in turn, ride over a pivoted cam 78 mounted on a
50 bracket 79 which is, in turn, pivoted at 80 on supports 81 on the main plate 10. (Figure 3.) The relationship of the teeth 77 and the cam 78 is such that no positive action of any associated parts takes place at this time.

On the return movement of the segment 28, however, the cam 78, being allowed to pivot in only one direction on account of encountering a stop 82 (Figure 1), necessarily rides under the inclined faces of the teeth 77, and its pivoted supporting bracket, together with the associated stop 82, is pushed outwardly, thereby making a contact between two points 83 of a spring switch
65 84 (Figures 1 and 3). The bracket 79 is held in normal position by means of a spring 85.

Also, when the bracket 79 is being moved rearwardly by the action of the teeth 77 in their counter-clockwise movement, this bracket contacts a pivoted arm 86 which, in turn, forms
70 part of a lever 87, the lever being pivotally mounted on a post 88 fixed on the plate 10 (Figures 1 and 3). A spring 89 coiled around the post 88 tends to hold the lever with its upper end in outward position as shown in Figure 1. 75

This lever 87 has a bent-over inner end 90 on which the arm 86 is pivotally mounted by means of a screw or the like 91, and a spring 92 tends to force the arm 86 into close relationship with the bracket 79 at all times. Obviously, an outward movement of the bracket 79 turns the arm 86 about its pivot point 91, thereupon allowing the spring 92 to move the upper end of the lever 87 inwardly about its pivot 91. If, as shown in Figure 1, the switch contact spring 93 is in lifted position on account of a projection 94 of an armature 95 contacting therewith, the insulating end 96 of the lever 87 will ride under the spring switch element 93, and accordingly keep it away from a corresponding switch contact element 97. If, however, the arm 95 is in downward position on account of the energizing of the magnet 98, which takes place when any pin is standing, the end of the arm 87 will simply abut against the up-turned end of the switch spring 93 which thereby prevents any further inward movement of this arm and the switch 93—97 thereupon remains closed.

This magnet 98 is in circuit with a series of ten contact elements mounted in the spots upon which the bowling pins are positioned on the bowling alley and which series of contacts is indicated at 99 in Figure 10. When any or all the pins are in position, current is delivered to the magnet 98 which accordingly draws its arm 95 downwardly whereupon any action of the arm 87—96 to hold open the switch contact 93—97 is prevented.

The magnet 115 is operated only when the players are bowling against their last frame or frames, and if a player makes a strike on this last frame, the pins, being all knocked down, circuit to the magnet 98 is broken and the armature 95 is raised, opening the switch 93—97. If the player makes a spare, this same action takes place on his second ball.

Therefore, when the switch 93—97 is open, the end 96 of the arm 87 is allowed to ride under the element 93, thereby holding this switch open, permitting play of one more ball. This is accomplished because the switch 93—97 is in the same circuit as the second ball contact element 24 which otherwise would operate the pawl 18 moving the wheel 14 up a final notch and thereby opening the switch 121—122 and shutting off the play.

As best shown in Figure 1, the pawl 18 which is operated by means of the magnet 20 shifts the feed wheel 14 in a counter-clockwise direction through a distance equal to the extent of one of its teeth every time an electrical current is caused to flow through the magnet 20, this being accomplished whenever a ball is returned to the bowler, inasmuch as the ball runs over a switch contact element 22 positioned in the runway. A second contact switch element 24 is also positioned in the runway but, at any time before the last frame, does not operate the magnet 20 unless the switch 99 is open which means that all of the pins have been knocked down by one ball. In this event, the pawl 18 is given two impulses, and the wheel 14 is accordingly moved through a distance of two of its teeth. The two switches 22 and 24 can be reversed, depending upon the original positioning of a switch 103.

The pawl 18 operates against a stop 100 adapted to prevent over-throw, and the link 101, by means of which this pawl is operated, is connected by means of a link 102 to a device which alternately opens and closes a switch 103. This

alternate switch 103 is either definitely open or closed immediately after the insertion of a coin into the device, the open positioning being accomplished by reason of the end 140 of the arm 87 (Figure 2) pushing the end of a trip 141 downwardly, in the event that this trip is in an upper position at that time, thereby preparing in advance for the contingency of the player making what is called a strike on the first ball.

If it is desired that this switch be preliminarily in closed position, this can be accomplished by an according regulation of the trip element 141 and its associated parts together with a reversal of the relative position of the switches 22 and 24 in the return gulley, all as explained above.

In addition to having the magnet 98 in the pin circuit, a magnet 112 is also in this circuit and its armature 142 is in downward position when any pin is standing. This position opens a switch 113—114 which is normally closed (Figure 10) when no pins are standing. The switch 113—114 is on the same line as the switch 103 and also in this circuit is a switch construction 126—127 (Figure 1) mounted on the segment 26. When all three of these switches are closed, a ball passing over the second contact 24 in the returnway will again actuate the magnet 20, as the contact 24 is also in this circuit. This is the reason for the alternately operating switch 103, as it is not desired to have the contact 24 operate the pawl 18 if a second ball is used on any frame.

If, however, the player does not succeed in knocking down all the pins, the pawl 18 is operated only once by the first ball rolling over the first contact 22, and this pawl 18, through its associated links 101 and 102, pulls the switch closing element 104 around its pivot point 105, thereby closing the switch 103. At the same time, a pivoted arm 106 has its inner end moved downwardly by the action of the link 102 and the outer end 147 of this arm thereupon contacts the lowermost element of the switch 103 and holds the switch in closed position. At the next operation of the magnet 20, the link 102, again moving downwardly, carries the finger cam 107 along with it, the end of which finger cam operates in a slot formed in the end of a pawl 108 which pawl is pivotally mounted on the end of the element 141, the rear end of which is formed with a notch 110 into which a pin fixed on the rear face of the element 106 fits when the inner end of the element 106 and the inner end of the element 108 are both in lowermost position.

The finger 107 operates to contact the end of the element 106 and push the same downwardly upon each alternating movement of the finger, this downward pushing operation being prevented upon every other alternate movement of the finger on account of its having ridden onto the slot in the end of the pawl 108, and its downward movement out of this notch itself is such that it rides over the face of the element 106 rather than contact the edge thereof.

When the player is nearing the end of his game, and is bowling against the last frame with his second ball, the switch 93 is closed, and current will be allowed to flow through this switch to the magnet 115, drawing down the armature 116 and closing a switch 117 associated therewith. This switch is in circuit with the second contact 24 in the runway and accordingly operates the pawl 18 for the last time for that frame. If not all the pins are knocked down by the player on his first ball in the last frame, he is entitled to roll a second ball in any event. If he then makes a

spare, he is entitled to a third ball. But, if he makes neither a spare nor a strike on his last frame, the operator of the magnet 115 automatically sets the wheel 14 up an extra notch by the action of the last ball on both contacts 22 and 24. The operation of the various magnets and switches just described will automatically take care of any such contingency of play.

After all the balls have been rolled, and depending upon the nature of the game played, the segment 26 will have been returned to its normal position by the action of the wheel 14 carrying the same along with it in its rotation after the pin 32 contacts the stop 38 and the device shall then have reassumed the position shown in Figure 1 wherein the segment 26 contacts the end of a link 120 which is mounted on one element 121 of a switch 121—122 (Figure 4) which switch is then opened, shutting off the entire device and a signal light 123 which was lighted when the operation was instituted upon the insertion of the first coin.

If the bowling alley is of the sort known as automatic or semi-automatic which are operated by means of a motor, such a motor may be inserted into the circuit as shown at 124, and this, of course, is also automatically started and stopped in conjunction with the signal light 123. At the same time that the pin 32 contacts the stop 38 (Figures 1 and 12) and begins to put the segment 26 into motion, an insulated breaker element 125 separates the contact elements 126 and 127 of the switch which is mounted on the segment in the form of the two arcuate metal bands 128 and 129, and with which there are always in contact two corresponding metal arms 130 and 131 respectively. The opening of this switch breaks the circuit to the second contact 24 in the returnway, eliminating this circuit when the players start in the last frames. At this time, the circuits associated with the magnets 98 and 115 are put into operation.

Referring to Figure 10, it will be seen that when the shelf 35 is depressed, following the insertion of a coin into the mechanism 72, an electrical connection is made between the switch points 41, thereby energizing the magnet 70, this magnet being connected directly into the main power line 150, as shown, by means of wires 151 and 152. Energization of the magnet 70 operates the lever 67, shifting the carriage 50, whereby the main control wheel 14 is released and allowed to move in a clockwise direction for a distance of 21 teeth, as previously described. Insertion of another coin allows a further movement of the main wheel 14 for a distance of another 21 teeth, and upon each of these operations, the segment 26 with its opposed attached segment 28, is correspondingly moved in a clockwise direction through a distance equal to one of the teeth 77, the coin 78 fitting into a corresponding notch upon each such movement.

The initial clockwise movement of the wheel 14 and the corresponding motion of the projection 120 thereon, effects a closing of the main switch 121—122, as illustrated, and the pins 153 being on and depressing the contacts 99, a current flow is also accordingly established through these contacts through the wire 154 and thence through the wire 155, to the magnet 112, which moves its armature 142 to the lowered position, as shown, whereby the switch 113—114 is disconnected. The current also flows on up to the armature 115, but on account of the fact that the wire 156, leading from this armature, ter-

minates at the open switch point 83, no action results here at this time. The current also goes on to the armature 98 and thence through the wire 157 to the signal light 123 and/or the motor 124.

In the position of the element 87—86 shown, depression of the armature 95 closes the switch 93—97, the contact point 97 being connected by means of a wire 163 to the wire 154, which branches to the main switch contact 122 on the one hand and to the ball contacts 22 and 24 on the other hand, also to the pin switch contacts 99 and the alternately operated switch contact 103—104. However, owing to the fact that the switch 116—117 is open at this time, no action results from the closing of the contacts 93—97. The branch wire 158 leading to the switch point 84 carries no current, as this switch is open. It also makes no difference at this point whether the contacts 103—104 are closed, inasmuch as the switch 113—114 is open, the connections here being the wires 161 and 162.

It is immaterial whether the switch 103—104 be closed or open at the beginning of each operation because the second switch in the return gully can be positioned accordingly, and as heretofore explained, this is alternately opened and closed during every movement of the armature of the magnet 20. The mechanical features which accomplish this alternate opening and closing being best shown at the right in Figure 1. Some of the essential parts are also illustrated in Figure 10.

When the bowling operation begins, it may be assumed that some of the pins 153 are knocked down upon the rolling of the first ball 159 which is then returned to the bowler, and in its progress along the return rails, passes over the contact point 22 closing this connection as shown in Figure 10. The wire 164 leads from this switch 22 up to the magnet 20 and thence through a wire 165 down to the corresponding branch of the main line 150. The other side of the switch leads through a wire 166 and 167 to the switch 113 which, because of the fact that the pins remain on the points 99, is still open. Also another branch 168 of the wire leads to the switch contact 117 which is also open. Hence, no action results from the contact of the ball 159 with the switch 22 if any pins 153 are left standing on the area. The ball, however, on its further progress down the return rail, closes the switch 24 which is also connected to the same wire 164 leading to the magnet 20 and thence back to the main line. The other side of this switch 24 is connected with the wire 154 which runs up through the closed switch 121—122 and thence back to the main line. Therefore, closing of this switch operates the solenoid of the magnet 20, in turn forcing the pawl 18 to impel the control wheel 14 in a counter-clockwise direction through a distance equal to one of its peripheral notches. Upon the operation of the magnet 20 and pawl 18, the switch 104—103 is opened so that if the bowler does succeed in knocking down the remaining pins on the next shot, his return ball will not operate the pawl 18 through the closing of the switch 22, but the closing of the switch 24 will operate in the same manner as before.

However, should the bowler at this or any other time, make what is known as a strike, namely the knocking down of all the pins upon the rolling of one ball, the contacts 99 will be opened, thereby releasing the solenoid of the

magnet 112 and operating to close the switch 113—114. Accordingly, the rolling of the ball on its return passage to the bowler, will, in operating the switches 22 and 24, cause two consecutive operations of the pawl 18, thereby moving the wheel 14 through the distance of two notches whenever a strike is made. In the meantime, of course, the preceding operation of the magnet 20 and the pawl 18 with associated parts will close the switch 103—104. In other words, the switch 103—104 must be always closed at the beginning of each so-called "frame". This is to assure against an extra operation of the switch 22 when the pins have been knocked down on the second shot, making what is known as a "spare", thereby closing the switch 113—114 and which connection would normally again operate the magnet 20 if it were not for the fact that the switch 103—104 was open at that time.

At the beginning of the tenth frame, there are several possibilities which may occur. The bowler may knock down all the pins with his first ball, in which event he is entitled to two more shots, or he may make what is known as a "spare" on his second ball, thereby entitling him to one extra shot. It is here that the pawl 78 comes into play, but this does not occur until after the last ball on the ninth frame has been rolled and returned, and passes over the contact 24. Movement of the sector 28 due to contact of the projection 32 with the element 34 caused by the operation of the pawl 18 following aforesaid closing of the switch 24 which preliminarily separates the contacts 126—127 and because of the operation of the pawl 18, will then cause the pawl 78 to ride part way out of the particular notch 77 in which it may be situated at the time depending upon the number of the players, and this outward movement closes the switch 82—84, and at the same time operates to force the jointed lever 88—87—96 inwardly. This is the first operation due to the return of the first ball of the last frame for a corresponding number of players depending upon the number of players who started. Opening of the switch 126—127 will eliminate any further current-carrying operations of the intermittent switch 103—104 regardless of its physical position from that time on and will also eliminate any electrical operation of the wires connected to the switch points 113 and 114 regardless of the physical position of the armature 142.

Current flowing through the wire 158 from the main line 150 to the switch point 94 will then pass to the wire 156 through the solenoid 115 operating its armature 116 and closing a switch 117. Current flows from the solenoid 115 through the wire 156 to the pin contacts, and if these are closed, back to the main line. However, this positioning does not occur until after the rolling and return of the first ball in the last frame because the contact 32 moves the element 34—38 upwardly through the distance of one notch in the wheel 14 before contact is made with the sector 28. In this manner, the switch 126—127 is opened by the last ball of the ninth frame, and the closing of the switch 82—84 does not take place until after the return of the first ball in the tenth frame. If the pins are not all knocked down upon the rolling of the first ball in the last frame, the return of the ball when passing over the switch 22 will not operate the pawl 18. When the switch 117 is closed due to the presence of pins on the alley and after operation of the switch 24 by the first ball of the

last frame, a connection will be made through the wire 166 to the first ball contact switch 22, and thence by way of the wire 164 to the solenoid 20 and the wire 165 back to the main line. On the other side, current will flow through the switch 93—97 through the wire 163 back through the switch 121—122 to the main line. This, of course, will operate the solenoid 20 when the ball contacts the first switch 22, and obviously the second ball switch 24 will always be operated. This occurs if neither a strike nor a spare is made in the last frame, whereupon these two movements of the control wheel 114 will bring it back to its original position opening the switch 121—122 which thereupon shuts off the motor 124.

In the event, however, that a player makes a strike upon the rolling of the first ball in the last frame, the contacts 99 will be opened, releases the armature 95 breaking the circuit 93—97 and preventing operation of the pawl 18 when the ball rolls over the first contact 22. Closing of the switch 24, however, will operate the pawl 18 moving the sector 28 through a further distance and causing the element 82 to force the jointed lever 88—96 beneath the extension of the switch contact 93, thereby holding the switch 93—97 open regardless of the position of the armature 95. This eliminates operation of the switch 22 before the return of the following two balls or the remainder of that frame.

In the event that the player makes a spare, namely, knocking down part of the pins on the first ball and the remainder on the second ball, the contacts 99 are closed for the first ball, thereby, on the second ball opening the switch 117 and also opening the switch 93—97, the contact 22 being broken, nothing happens at this point, but on closing of the switch 24, the element 82 rests against the end of the projection 93 on the first ball, and the pins being knocked off in making a spare, breaks the circuit 93—97, permitting the element 86 to ride beneath the projection of the contact 83, thereby holding the circuit open, permitting the play of one more ball.

It will be seen that herein is provided a positive coin control for bowling alleys which will automatically take care of the needs of any number of players from one to five upon the insertion of the corresponding number of coins into the device and which will operate positively and correctly regardless of the variations in play caused by the luck or skill of the players and the corresponding rules of the game applicable to such contingencies. The automatic step-up of the device whenever a play is made which eliminates the necessity of rolling an additional ball is one of the main features of the positive control of this invention, and the further automatic manner in handling the exigencies of play which may occur toward the end of each player's frame constitutes another important feature as the apparatus automatically provides for a required or necessary number of balls to complete the play of each and every individual user regardless of whether he makes strikes, spares or even misses the pins completely. The apparatus will also properly take care of the play of any number of players from one to five regardless of whether or not they observe a predetermined sequence in rolling their balls against the pin. With slight modifications and variations, this coin control and attendant counting mechanism may be ap-

plied to operations and games other than bowling and is particularly applicable whenever an automatic control is required for a variable or varying number of operations which cannot be predetermined in advance, but which by their own variations cause the machine to assume and control certain situations as they arise.

I am aware that many changes may be made and numerous details of construction varied throughout a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted herein otherwise than as necessitated by the prior art.

I claim as my invention:

1. In a bowling alley, having the usual pins, pin-spots, balls and return gulley, electrical contacts forming part of the pin spots on the alley, and controlled by the pins, electrical contacts in the gulley controlled by the balls as they return through the gulley, means for automatically indicating the stopping of the play at the end of ten frames for each player regardless of the number of balls used in said frames, said means including a notched control wheel and an electrical circuit, coin-controlled means for preliminarily moving the wheel a predetermined distance in a clockwise direction and closing the circuit, and electrical connections, between the wheel and pin spots, said connections including magnets and associated pawls for operating the toothed wheel.

2. In a bowling alley, having the usual pins, pin-spots, balls and return gulley, electrical contacts forming part of the pin spots in the alley, further electrical contacts on the gulley controlled by the balls returning through the gulley, means for automatically indicating the stopping of the play at the end of ten frames for each player regardless of the number of balls used in said frames, said means including toothed control wheels and an electrical circuit, release, coin-controlled means for preliminarily moving at least one of the control wheels a predetermined distance in a clockwise direction and closing the circuit, means for allowing the wheels to move in one direction, magnets for the release means, and contact elements in the coin control connected to the magnets.

3. In a bowling alley, having the usual pins, pin-spots, balls and return gulley, electrical contacts forming part of the pin spots in the alley, further electrical contacts on the gulley controlled by the balls returning through the gulley, means for automatically indicating the stopping of the play at the end of ten frames for each player regardless of the number of balls used in said frames, said means including toothed control wheels and an electrical circuit, release, coin-controlled means for preliminarily moving at least one of the control wheels a predetermined distance in a clockwise direction and closing the circuit, means for allowing the wheels to move in one direction, magnets for the release means, and contact elements in the coin control connected to the magnets, and pawls actuated by magnets connected to the contacts in the return gulleys for moving the control wheels in another direction.

4. In a coin control for bowling alleys having the usual pins, balls and return gulley, means for automatically indicating a limit of the play to ten frames regardless of the number of balls used in said frames, said means including a toothed device and an electrical circuit, coin-controlled means for preliminarily moving the toothed device a predetermined distance in one

direction upon the insertion of a coin into the device, and closing the circuit and contact plates forming part of the pin spots in the alley, a return gulley for the balls, ball-operated switches in the return gulleys, magnets and pawls associated with the toothed device for forward release and rearward operation of same, and electrical connections between the contact plates, return gulleys and magnets.

5. In a coin-operated bowling alley, having the usual pins and balls, metallic spots for the pins and a return gulley for the balls, a pair of electrical contacts in the return gulley, controlled by the balls as they return through the gulley means for indicating stopping of play at the end of ten frames for each player regardless of the number of balls used in the frames, said means including a notched control wheel and an electrical circuit, coin-controlled means for moving the notched wheel a predetermined distance in a clockwise direction upon the insertion of a single coin into the device, and at the same time, closing the circuit, and means for moving the control wheel further predetermined distances upon the insertion of additional coins, the circuit remaining closed means for feeding the wheel a step at a time in a counter-clockwise direction upon the return of each ball rolled, and means for moving the wheel two notches upon the return of a ball whenever a play occurs which eliminates the necessity of rolling a second ball to complete a frame, said means including a magnet and pawl associated with the wheel, and electrical connections between the pin spots and the switch in the ball return gulleys.

6. In a coin-operated device for bowling alleys, having the usual pins and balls, metallic spots for the pins and a return gulley for the balls, a pair of electrical contacts in the return gulley, controlled by the balls as they return through the gulley, means for indicating stopping of play at the end of ten frames for each player regardless of the number of balls used in the frames, said means including a notched control wheel, coin-controlled means for preliminarily moving the notched wheel a predetermined distance in a clockwise direction and closing the circuit, means for feeding the wheel a step at a time in a counter-clockwise direction upon the return of each ball rolled, and means for moving the wheel two notches upon the return of a ball whenever a play occurs which eliminates the necessity of rolling a second ball to complete a frame, said means including a magnet and pawl associated with the wheel and electrical connections between the pin spots and the switches in the ball return gulleys.

7. In a coin-operated device for bowling alleys having the usual pins, pin spots, balls and return gulley, means for indicating the stopping of play at the end of ten frames for each player regardless of the number of balls used in a frame, said means including a notched control wheel and an electrical circuit, means for preliminarily moving the wheel a predetermined distance in a clockwise direction upon the insertion of a coin into the device, contact means associated with each pin on the alley, further contact means in the ball return gulley, and magnet-operated pawls electrically connected with said contact means for feeding the wheel in a counter-clockwise direction upon the return of each ball together with an auxiliary alternately operated switch operated in conjunction with the magnet and pawl and connected to the switches in the

return gulley for controlling extra ball operation.

8. In a coin-operated device for bowling alleys having the usual pins, pin spots, balls and return gulley, means for indicating the stopping of play at the end of ten frames for each player regardless of the number of balls used in a frame, said means including a notched control wheel and an electrical circuit, means for preliminarily moving the wheel a predetermined distance in a clockwise direction upon the insertion of a coin into the device, contact means associated with each pin on the alley, further contact means in the ball return gulley, and magnet-operated pawls electrically connected with said contact means for feeding the wheel in a counter-clockwise direction upon the return of each ball, an auxiliary alternately operated switch operated in conjunction with the magnet and pawl and connected to the switches in the return gulley for controlling extra ball operation, and means for preliminarily setting said switch into a predetermined position immediately after the insertion of a coin into the device.

9. In a coin-operated device for bowling alleys having the usual pins, pin spots, balls and return gulley, means for indicating the stopping of play at the end of ten frames for each player regardless of the number of balls used in a frame, said means including a notched control wheel and an electrical circuit, means for preliminarily moving the wheel a predetermined distance in a clockwise direction upon the insertion of a coin into the device, said means including a switch associated with and operated by the coin inlet, a magnet and pawls for releasing the wheel for clockwise motion, electrical connections between said magnet and the coin-controlled switch, electrical contact means associated with each pin on the alley, further contact means in the ball return gulley, and magnet-operated pawls electrically connected with said contact means for feeding the wheel in a counter-clockwise direction upon the return of each ball, an auxiliary alternately operated switch operated in conjunction with the magnet and pawl and connected to the switches in the return gulley for controlling extra ball operation, and means for preliminarily setting said switch into a predetermined position immediately after the insertion of a coin into the device.

10. In a coin-operated bowling alley control, means for indicating the stopping of play at the end of ten frames for each player regardless of the number of balls used in a frame, said means including a notched control wheel, electrical contact means associated with each pin on the alley together with further electrical contact means in the ball return gulley, and magnet-operated pawls electrically connected with said contact means for feeding the wheel in a counter-clockwise direction upon the return of each ball, an auxiliary alternately operated switch operated in conjunction with the magnet and pawl and connected to the switches in the return gulley for controlling extra ball operation, means for preliminarily setting said switch into a predetermined position immediately after the insertion of a coin into the device, a further switch associated with and operated by the coin inlet, a magnet and pawls for releasing the wheel for clockwise motion, electrical connections between said magnet and the coin-control switch, a main switch, and means for automatically closing the main switch upon the first clockwise movement of the control wheel.

11. In a bowling alley having the usual pins, pin-spots, balls and return gulley, means for indicating the stopping of play at the end of ten frames for each player regardless of the number of balls used in a frame, said means including a notched control wheel and an electrical circuit, coin-controlled means for preliminarily moving the wheel a predetermined distance in a clockwise direction upon the insertion of a coin, electrical contact means associated with each pin on the alley, further contact means in the ball return gulley controlled by the balls as they return through the gulley, and magnet-operated pawls electrically connected with said contact means for feeding the wheel in a counter-clockwise direction upon the return of each ball together with an auxiliary alternately operated switch operated in conjunction with the magnet and pawl and connected to the switches in the return gulley for controlling extra ball operation, means for preliminarily setting said switch into a predetermined position immediately after the insertion of a coin, a switch associated with and operated by the coin inlet, a magnet and pawls connected to said coin switch for releasing the wheel for a predetermined clockwise motion upon the insertion of each coin, and electrical connections between said magnet and the coin-control switch, together with a main switch, and means for automatically closing the main switch upon the first clockwise movement of the control wheel, together with means for automatically opening said main switch upon the passage of the last playing ball down the return gulley.

12. In a bowling alley having the usual pins, pin spots, balls and return gulley, coin-controlled means associated with the alley for automatically indicating the number of balls to be used according to the play, said means including a toothed wheel, and means for preliminarily setting the wheel according to the number of players, said means including a coin-operated switch, a magnet electrically connected to the switch, and a set of release pawls and ratchet wheels operated by the magnet and operatively associated with the periphery of the toothed wheel, together with a segmental wheel rotatably mounted for operative association with the toothed wheel, and electrical switch opening and closing means on the segmental wheel, and two sets of auxiliary control teeth in said segmental wheel, one set of control teeth being larger than the others, and a pawl operatively associated with said larger teeth, and means for releasing the sector for movement over the pawl and its interfitting into a corresponding space between the teeth on the insertion of each coin into the machine.

13. In a bowling alley having the usual pins, pin spots, balls and return gulley, coin-controlled means associated with the alley for automatically indicating the number of balls to be used according to the play, said means including a toothed wheel, and means for preliminarily setting the wheel according to the number of players, said means including a coin-operated switch, a magnet electrically connected to the switch, and a set of release pawls and ratchet wheels operated by the magnet and operatively associated with the periphery of the toothed wheel, together with a segmental wheel rotatably mounted for operative association with the toothed wheel, and electrical switch opening and closing means on the segmental wheel, and two sets of auxiliary control teeth in said segmental wheel, one set of control teeth being larger than the others, and

a pawl operatively associated with said larger teeth, and means for releasing the sector for movement over the pawl and its interfitting into a corresponding space between the teeth on the insertion of each coin into the machine, and switch means for regulating the play of extra balls associated with the pawl.

14. In a bowling alley having the usual pins, pin spots, balls and return gulley, coin-controlled means associated with the alley for automatically indicating the number of balls to be used according to the play, said means including a toothed wheel, and means for preliminarily setting the wheel according to the number of players, said means including a coin-operated switch, a magnet electrically connected to the switch, and a set of release pawls and ratchet wheels operated by the magnet and operatively associated with the periphery of the toothed wheel, together with a segmental wheel rotatably mounted for operative association with the toothed wheel, the segmental wheel being in a plane parallel to the plane of the toothed wheel but freely rotatable relatively thereto, and means for rotating the segmental wheel concurrently with the toothed wheel beginning with the playing of the tenth frame.

15. In a bowling alley having the usual pins, pin spots, balls and return gulley, coin-controlled means associated with the alley for automatically indicating the number of balls to be used according to the play, said means including a toothed wheel, and means for preliminarily setting the wheel according to the number of players, said means including a coin-operated switch, a magnet electrically connected to the switch, and a set of release pawls and ratchet wheels operated by the magnet and operatively associated with the periphery of the toothed wheel, together with a segmental wheel rotatably mounted for operative association with the toothed wheel, the segmental wheel being in a plane parallel to the plane of the toothed wheel but freely rotatable relatively thereto, and means for rotating the segmental wheel concurrently with the toothed wheel beginning with the playing of the tenth frame, together with current-carrying switches on the segmental wheel, and mechanical means for automatically opening and closing said switches upon movement of the segmental wheel into a predetermined position.

16. In a bowling alley having the usual pins, pin spots, balls and return gulley, coin-controlled means associated with the alley for automatically indicating the number of balls to be used according to the play, said means including a toothed wheel, and means for preliminarily setting the wheel according to the number of players, said means including a coin-operated switch, a magnet electrically connected to the switch, and a set of release pawls and ratchet wheels operated by the magnet and operatively associated with the periphery of the toothed wheel, together with a segmental wheel rotatably mounted for operative association with the toothed wheel, the segmental wheel being in a plane parallel to the plane of the toothed wheel but freely rotatable relatively thereto, and means for rotating the segmental wheel concurrently with the toothed wheel beginning with the playing of the tenth

frame, together with current-carrying switches on the segmental wheel, and mechanical means for automatically opening and closing said switches upon movement of the segmental wheel into a predetermined position, and control magnets connected with the switch contacts on said segmental wheel.

17. In a bowling alley having the usual pins, pin spots, balls and return gulley, coin-controlled means associated with the alley for automatically indicating the number of balls to be used according to the play, said means including a toothed wheel, and means for preliminarily setting the wheel according to the number of players, said means including a coin-operated switch, a magnet electrically connected to the switch, and a set of release pawls and ratchet wheels operated by the magnet and operatively associated with the periphery of the toothed wheel, together with a segmental wheel rotatably mounted for operative association with the toothed wheel, the segmental wheel being in a plane parallel to the plane of the toothed wheel but freely rotatable relatively thereto, and means for rotating the segmental wheel concurrently with the toothed wheel beginning with the playing of the tenth frame, together with current-carrying switches on the segmental wheel, and mechanical means for automatically opening and closing said switches upon movement of the segmental wheel into a predetermined position, and control magnets connected with the switch contacts on said segmental wheel, electrical contact means for the pins on the alley, and current-carrying connections between the switches on the segmental wheel and the pin contact means.

18. In a bowling alley having the usual pins, pin spots, balls and return gulley, coin-controlled means associated with the alley for automatically indicating the number of balls to be used according to the play, said means including a toothed wheel, and means for preliminarily setting the wheel according to the number of players, said means including a coin-operated switch, a magnet electrically connected to the switch, and a set of release pawls and ratchet wheels operated by the magnet and operatively associated with the periphery of the toothed wheel, together with a segmental wheel rotatably mounted for operative association with the toothed wheel, the segmental wheel being in a plane parallel to the plane of the toothed wheel but freely rotatable relatively thereto, and means for rotating the segmental wheel concurrently with the toothed wheel beginning with the playing of the tenth frame, together with current-carrying switches on the segmental wheel, and mechanical means for automatically opening and closing said switches upon movement of the segmental wheel into a predetermined position, and control magnets connected with the switch contacts on said segmental wheel, electrical contact means for the pins on the alley, and current-carrying connections between the switches on the segmental wheel and the pin contact means, together with further electrical switches in the ball-return gulleys, and connections between said switches and the switches carried on and operated by the segmental wheel.

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