July 9, 1940. E. G. STRONG 2,207,643

BOWLING ALLEY

Filed Jan. 31, 1939 6 Sheets-Sheet 1

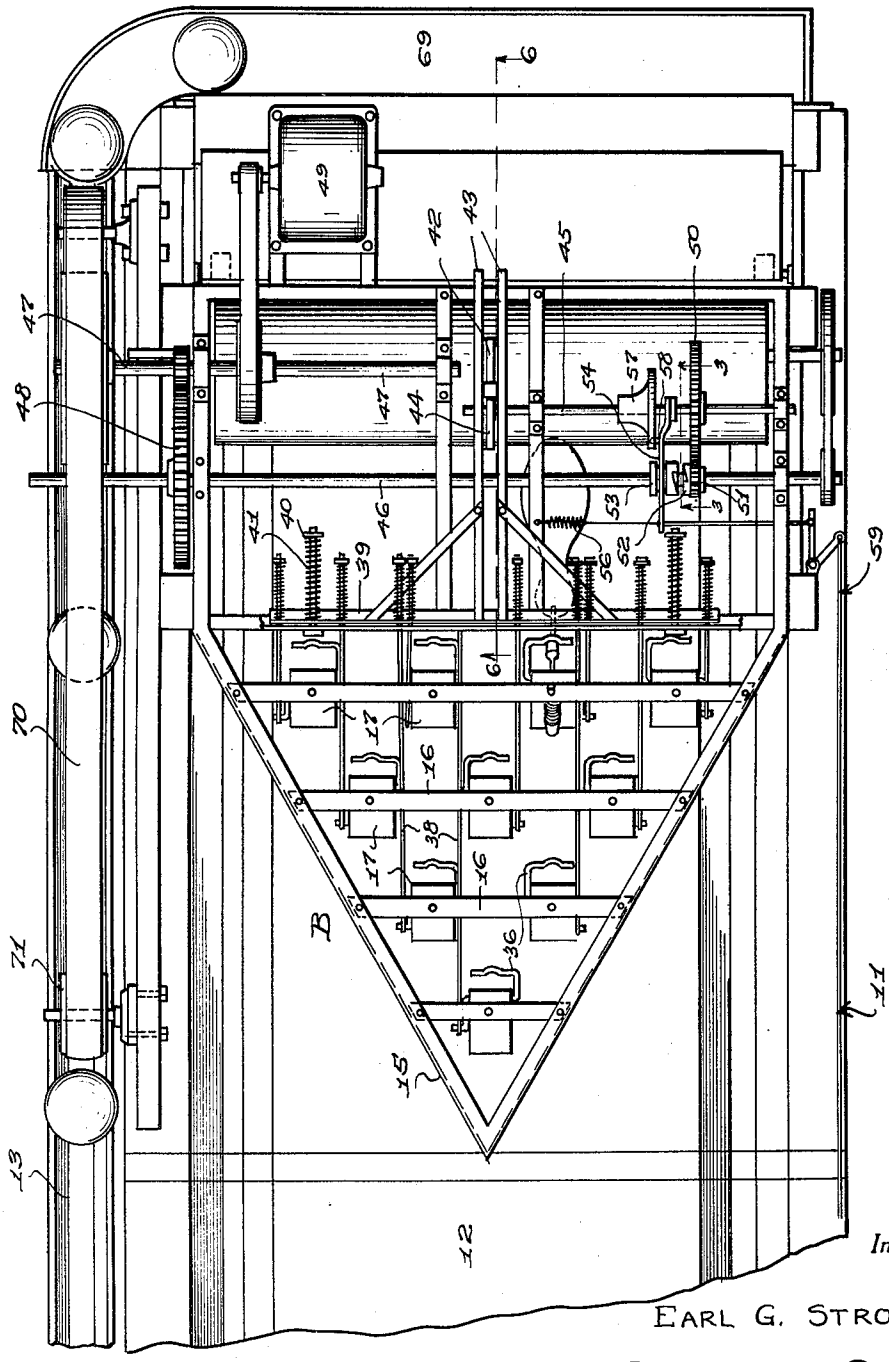

Fig. 1.

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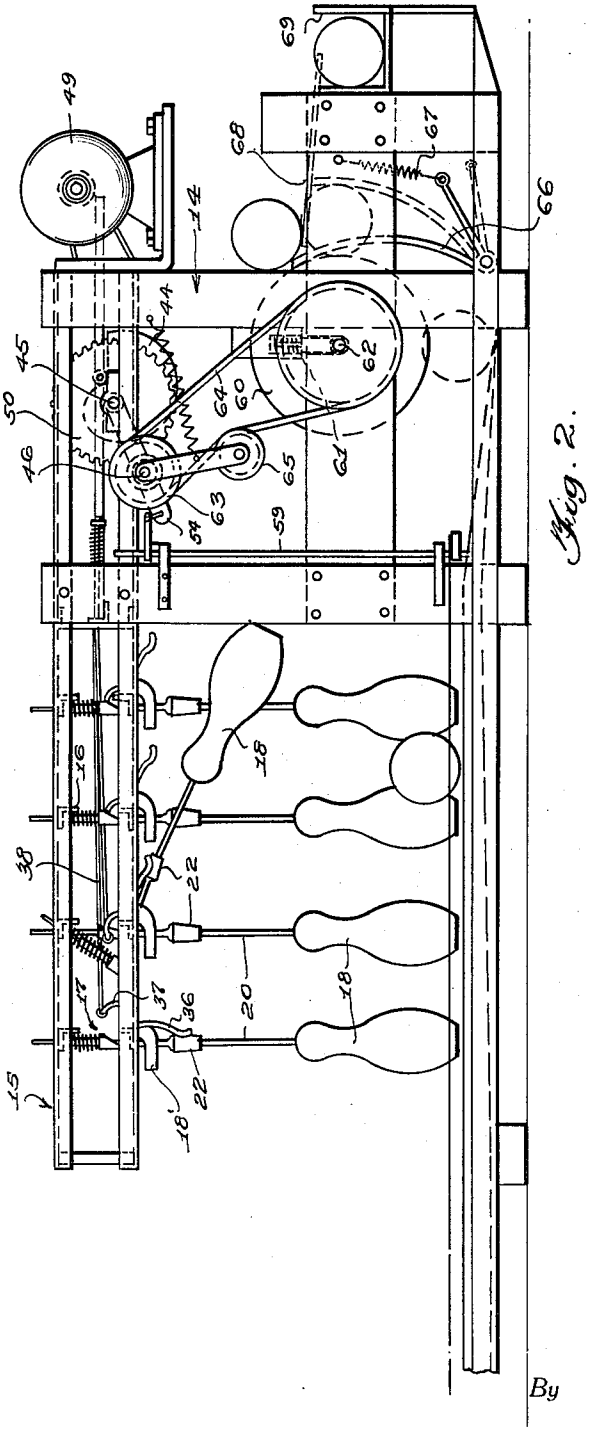

Fig. 2.

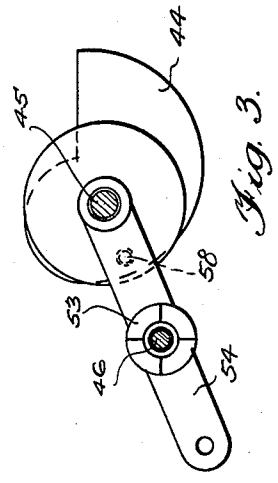

Fig. 3.

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BOWLING ALLEY

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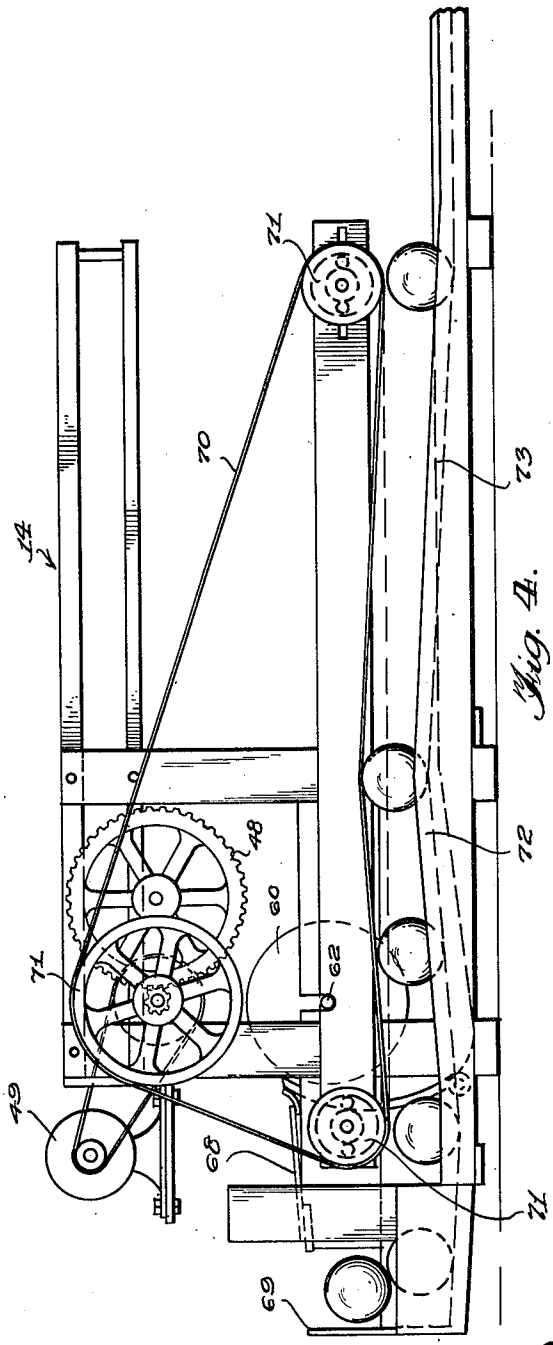

Fig. 4.

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BOWLING ALLEY

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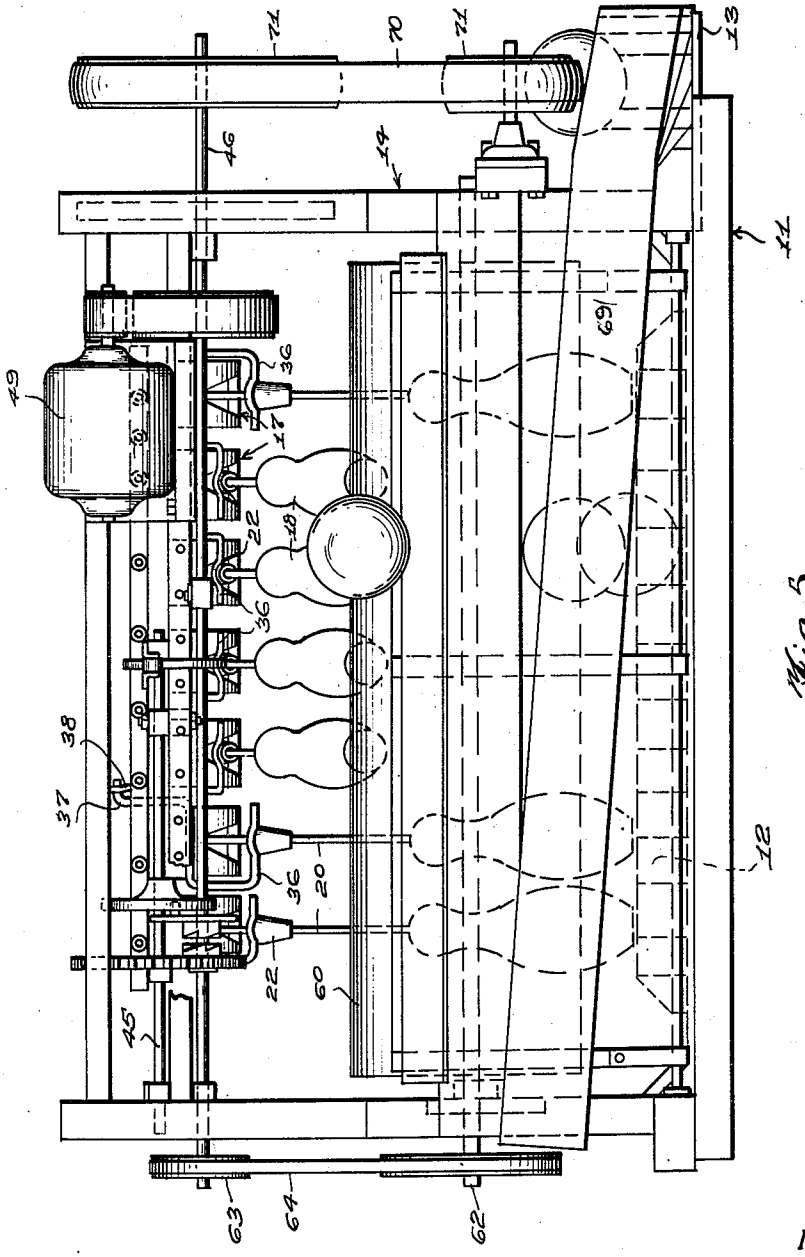

Fig. 5

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BOWLING ALLEY

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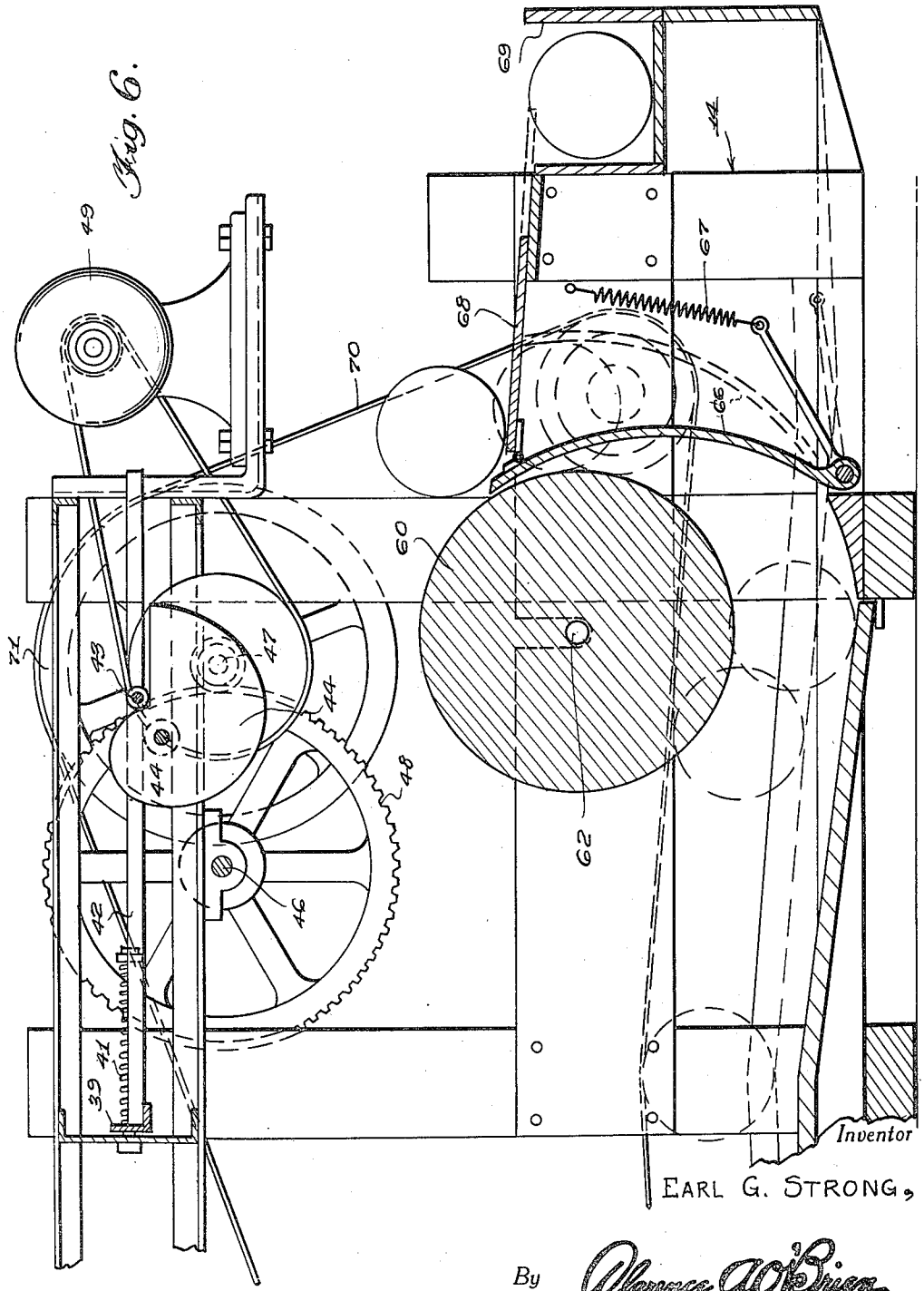
Fig. 6.



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BOWLING ALLEY

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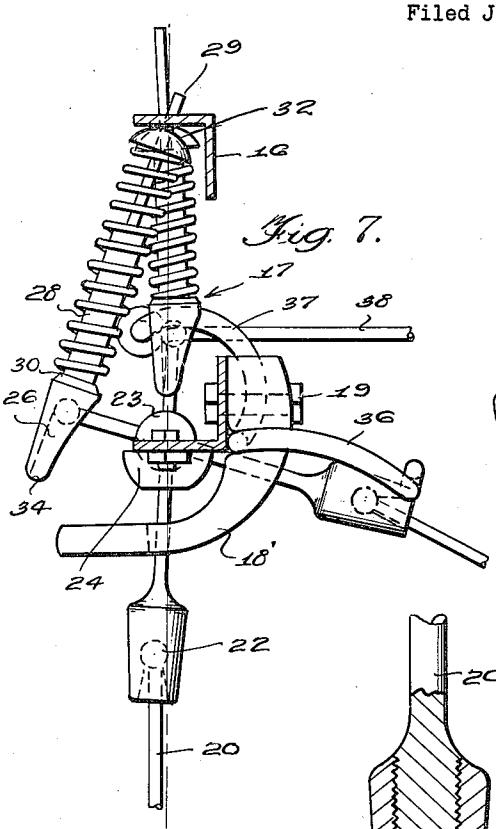


Fig. 7.

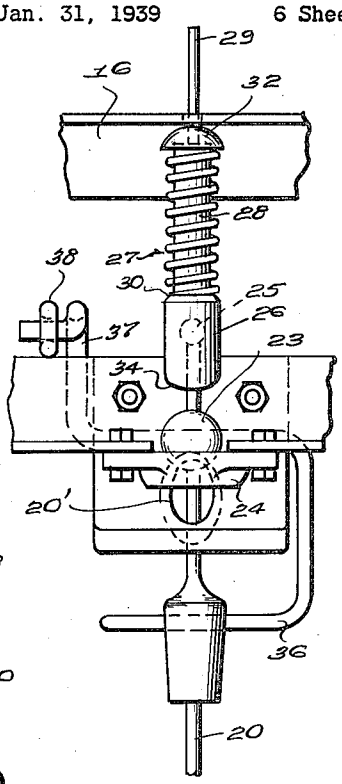


Fig. 8.

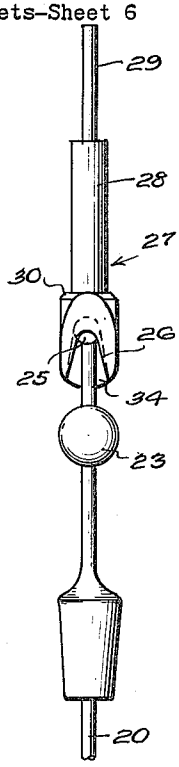


Fig. 9.

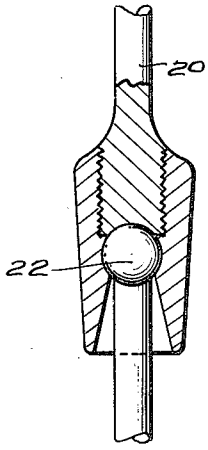
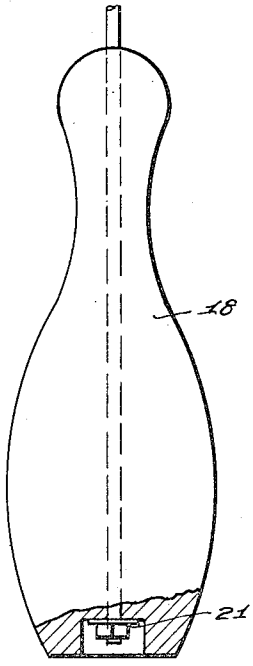


Fig. 10.



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2,207,643

UNITED STATES PATENT OFFICE

2,207,643

BOWLING ALLEY

Earl G. Strong, Milan, Ohio

Application January 31, 1939, Serial No. 253,897

6 Claims. (Cl. 273—44)

This invention relates to bowling alleys and more particularly to playing pin supporting and resetting mechanism in combination with a playing ball check and return means. The primary object of this invention is the provision of means whereby the player may reset the pins with minimum effort from a playing position and the playing balls automatically returned to the player's ball rack or to the playing end of the alley.

Another object of the invention is the provision of means wherein the pins will be suspended in a vertical or playing position and be free to swing within a prescribed limit and when struck by a ball will be automatically raised to a substantially horizontal position either singly or in groups and thus maintained until released so that they will not interfere with subsequent plays that may be made for pins remaining in vertical or playing position.

With these and other objects in view, the invention consists in certain novel features of construction, combination and arrangement of parts to be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which

Figure 1 is a fragmentary top plan view illustrating a bowling alley constructed in accordance with my invention.

Figure 2 is a fragmentary side elevation illustrating the device, and showing one of the pins in a substantially horizontal position while the remaining pins are supported in vertical or playing position.

Figure 3 is a detail sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a fragmentary side elevation looking at the opposite side of the device from that shown in Figure 2 and illustrating the ball return mechanism.

Figure 5 is a rear or end elevation illustrating the device with certain of the pins in substantially horizontal position while the other pins are in vertical or playing position.

Figure 6 is a sectional view taken on the line 6—6 of Figure 1 showing the ball check means including the means of raising and delivering the ball into a collecting chute for gravitation into a return gutter.

Figure 7 is a fragmentary vertical sectional view showing the means for releasably retaining a pin in playing or vertical position and for the elevation thereof into a substantially horizontal position.

Figure 8 is a fragmentary front elevation illustrating the means as shown in Figure 7.

Figure 9 is a fragmentary rear elevation showing a portion of the locking means and its connection with the pin supporting rod.

Figure 10 is a fragmentary vertical sectional view illustrating a joint employed in the pin supporting rod.

Referring in detail to the drawings, the numeral 11 indicates a fragmentary portion of a bowling alley including the usual floor 12 over which the playing balls are rolled as customary in bowling. A ball return trough or gutter is indicated by the character 13 and extends along one side of the floor 12 for the return of the playing balls to the playing end of the alley or to the usual ball rack located at the player's end of the alley. The pin end of the alley is indicated generally by the character B and associated with said end of the alley is a supporting structure 14 on which is mounted a pin supporting frame 15 of triangular shape and located above the pin end of the alley, indicated by the character B, or over the place on the floor 12 where the pins are spotted or arranged in playing position. The supporting frame 15 includes a plurality of transversely arranged and relatively spaced bars 16. The pin supporting frame 15 as is apparent in Figure 2 is constructed of upper and lower triangular shaped portions with bars 16 secured to each portion and with the bars arranged in pairs with the bars of each pair located in superimposed relation.

Combined pin supporting, locking and elevating devices 17 are carried by the bars 16 and to which are connected the playing pins 18 whereby said playing pins may be either supported in vertical or playing position or supported in substantially horizontal position and releasably secured in either of said positions.

Each of the combined pin supporting, locking and elevating mechanisms is identical in construction and reference to one specifically is thought sufficient to give a clear understanding of the operation of this part of the invention. The mechanism 17 includes an arcuately curved bracket 18' suitably fastened on one of the bars or members 16, as indicated at 19, and is provided with an elongated opening 20' through which extends a pin rod 20 and as shown in Figure 10, the rod 20 extends completely through the pin 18 and has threaded thereon a retaining nut 21 countersunk in the lower end of the pin. The rod 20 includes sections connected together by a ball and socket joint 22 whereby the lowermost

section or the section attached to the pin 18 may have a free swinging movement within a prescribed limit or, in other words, when the pin 18 is supported vertically and struck by a ball it may swing in a direction influenced by the impact of the ball therewith so that in many instances the pin struck may also strike a neighboring pin for moving the same sufficiently to bring about its elevation along with the pin struck by the ball to a substantially horizontal position. Of course, it is to be understood that if the impact of the ball with the first pin is sufficient to bring about excessive swinging movement of that pin it may strike several of its neighboring pins and cause them to be automatically elevated along with the pin struck to a substantially horizontal position.

The uppermost section of the rod 20 extends through the elongated opening 20' of the bracket 18' and is equipped with a bearing element 23 of spherical shape having seated relation with a cup type bearing 24 mounted on the member 16 adjacent the bracket 18'. It is to be understood that the cup-shaped bearing 24 allows the upper section of the rod 20 to move or swing freely therein. The upper end of the uppermost section of the rod 20 is equipped with a ball 25 received within a socket 26 of a locking device 27 in the form of a plunger 28 having the socket 26 in one end thereof and its opposite end reduced, as shown at 29, to slide through an opening in one of the uppermost members 16. The socketed end of the plunger 28 enlarges said end to present a shoulder seat 30 for one end of a coil spring 31 to engage, the other end of the coil spring bearing in a semi-spherical shaped cup 32 mounted on the reduced end 29 of the plunger 28 and bearing against the uppermost member 16. Thus it will be seen that the plunger 28 may have a pivotal movement to assume either of the positions as shown in Figure 7 and when in a substantially vertical position the plunger is forcing the pin rod 20 downwardly with the bearing 23 thereof in engagement with the seat 24 positioning the pin 18 in playing or vertical position. The plunger 28 when in this position is slightly to one side of dead center position, consequently retaining the upper section of the pin rod 20 in a substantially vertical position which maintains the pin 18 in playing position free for the limited swinging movement if struck by a ball.

The socket 26 has one wall cut away in order to define a lip or extension 34 which bears against the upper section of the rod 20 when retaining the pin 18 in playing position. When the pin 18 is struck by a ball swinging movement is imparted thereto which, of course, is imparted to both sections of the pin rod 20, the upper section pivoting on the seat 24 and in so doing creates a force on the plunger 28 to move the latter from a substantially vertical position past dead center position and as the plunger leaves dead center position the spring 31 shoves the plunger downwardly, as shown in Figure 7, elevating the rod 20 and consequently the pin 18 into a substantially horizontal position, the pin retaining this position until the plunger is again returned to its substantially vertical position, as shown in Figure 7, through a mechanism which will be hereinafter described in detail and which, of course, restores the pin to playing or vertical position.

The mechanism for restoring or freeing the pins from substantially horizontal position consists of a series of pivotally mounted arms 36 engageable with the pin rod 20 or the ball and socket joints thereof and are pivotally mounted on the lower members 16 of the supporting frame 15 and include arcuately curved portions 37 to which operating rods 38 are connected. The operating rods 38 are slidable through an operating bar 39 slidably mounted on the supporting structure 14. The free ends of the rods 38 are equipped with heads 40 engaged by coil springs 41 mounted on said rods and which also bear against the operating bar 39 providing a yieldable driving connection between said rods and the bar. The bar 39 is mounted for sliding movement and includes spaced members 42 carrying a roller 43 which rides a cam 44 having high and low faces as clearly shown in Figure 3 and is secured on a shaft 45 suitably journaled on the supporting structure 14. As the cam 44 completes one revolution the operating bar 39 is caused to slide rearwardly and then forwardly. The rearward movement of the bar 39 operates the arms 36 through the rods 38 for the purpose of swinging the pin 18 and pin rod 20 downwardly into vertical position causing the plunger 28 to slide upwardly and assume substantially vertical position slightly past dead center position, thereby releasably securing the pins 18 in playing position.

A driven shaft 46 is journaled on the supporting structure 14 and is geared to a drive shaft 47 by gears 48. The drive shaft 47 is journaled on the supporting structure and is belted to an electric motor 49 mounted on the supporting structure. It is to be understood that the motor 49 is kept running when the bowling alley is in use.

A gear 50 is secured on the cam shaft 45 and meshes with a gear 51 journaled on the driven shaft 46 and which includes a clutch element 52. Splined on the driven shaft 46 is a clutch element 53 to coact with the clutch element 52 in releasably securing the gear 51 to the driven shaft 46. The clutch element 53 is grooved to receive an operating lever 54 one end of which is journaled on the cam shaft 45 and the opposite end connected to a spring means 56 acting to position the clutch element 53 out of engagement with the clutch element 52.

A timing disc 57 is secured on the shaft 45 and in a face thereof is provided with a socket to receive a pin 58 carried by the lever 54. The spring 56 acts to maintain the pin in riding contact with the timing disc 57. An operating means 59 is connected to the free end of the lever 54 and extends to the playing end of the alley whereby the player whenever desiring to set or arrange the pins 18 in vertical or playing position may shift the position of the lever 54 to engage the clutch element 53 with the clutch element 51 starting the cam shaft 45 to rotating, also the timing disc 57. The rotation of the cam shaft 45 through the cam 44 and roller 43 bring about retraction of the operating rods 38 to affect the plungers 28 and restore the pins 18 to playing or vertical position over the alley. As the lever 54 is moved to engage the clutch element 53 with the clutch element 52 the pin 58 is withdrawn from the socket and then rides the face of the timing disc 57 until the cam has completed one revolution when the pin again reenters the socket and allows the spring 56 to restore the lever 54 to the position of disengaging the clutch element 53 from the clutch element 52 stopping the operation of the cam and

naturally the resetting mechanism of the pins 18.

The operating mechanism 59 consists of a series of bell crank levers and connecting links, one of which extends to the playing end of the alley in convenient reach of the player so that it may be gripped and pulled for effecting the operation of the lever 54.

From the foregoing description it can be readily seen how the playing pins 18 are restored to playing or vertical position directly over the alley and slightly spaced therefrom by the player from their substantially horizontal position and through the construction described any pins after playing a box remaining vertical will not be disturbed by the resetting of the pins from horizontal position to playing position.

A check roller 60 is journaled on the supporting structure 14 rearwardly of the pins and the floor of the alley rearwardly of the playing position of the pins and in the direction of the check roller slopes downwardly, as clearly shown in Figure 6, so that the playing balls after passing the pins will gravitate into engagement with the check roller 60 and pass slowly thereunder or in accordance with the speed of rotation of the roller 60. The roller 60 is mounted in bearings 61 on the supporting structure 14 for a limited vertical movement, the bearings 61 including springs acting to urge the roller downwardly into a position sufficient to be contacted by the playing ball and act as a check therefor. However, as the roller 60 rotates the playing balls may pass thereunder, the roller 60 being free to move upwardly a limited distance sufficient to permit the playing balls to be fed thereunder by the rotation of said roller 60. The shaft of the roller 60 is indicated by the character 62 and is belted to a pulley 63 secured on the driven shaft 46. The belt employed for belting the shaft 62 to the pulley 63 is indicated by the character 64 and is engaged by a spring influenced belt tightener 65. Thus it will be seen that the check roller is always in rotation during the operation of the motor 49 so as to check the playing balls after passing the pins and to feed the playing balls thereunder into engagement with a spring influenced arcuately curved plate 66 pivotally mounted on the supporting structure 14 rearwardly of the check roller. The elevating plate 66 is urged in the direction of the check roller by a spring 67 so that as a ball is fed under and past the check roller due to the rotation of the latter it comes in contact with the elevating plate 66 and caused to travel upwardly of the latter causing said elevating plate to pivot away from the check roller sufficient to permit the playing balls to climb until they pass the free end of the check plate whence they may roll onto a delivery platform 68 hinged to the elevating plate 66 and slidably supported by the supporting structure 14 terminating over an inclined collecting chute 69 leading to the gutter or trough 13.

As the playing ball leaves the collecting trough 69 and enters the trough 13 it comes in contact with an endless belt 70 and is caused to travel with considerable speed in the trough 13 toward the player's end of the alley. As the ball leaves the endless belt 70 it has sufficient momentum to carry it to the player's end of the alley or onto the usual ball rack provided at said end of the alley.

The endless belt 70 is trained over a series of pulleys 71 a pair of which is journaled on the supporting structure and one of said pulleys is secured on the driven shaft 46 so as to be driven by the motor and thereby bring about operation of the endless belt over a portion of the trough 13. The trough 13 where passing under the lower run of the endless belt 70 includes an upwardly inclined portion 72, as clearly shown in Figure 4, for the purpose of causing the balls to travel upwardly and tightly against the lower run of the belt when being fed along the trough 13 by the operation of said belt. Another portion of the trough 13 under the lower run of the belt 70 slopes downwardly, as shown at 73, so that the balls after being in contact with the lower run of the belt may leave the latter freely with sufficient momentum to carry them to the player's end of the alley and onto the usual ball rack (not shown). Therefore, from the foregoing description it will be seen that as the balls pass the pins or after striking said pins come in contact with the check roller and pass thereunder due to the rotation of said check roller and are fed upwardly onto the platform 68 whence they gravitate into the receiving trough 69 and from the latter into the trough 13 for engagement with the endless belt to be driven thereby to the playing end of the alley and onto the usual ball rack.

It is believed that the foregoing description, when taken in connection with the drawings will fully set forth the construction and advantages of this invention to those skilled in the art to which such a device relates, so that further detailed description will not be required.

Having thus described the invention, I claim:

1. In a bowling alley, a playing floor having a ball return trough and pins, a supporting structure at the pin end of the floor, a pin frame carried by the supporting structure and arranged over the floor, a plurality of pin suspending and elevating devices carried by the pin frame whereby the pins may be suspended in playing position over the floor and elevated into substantially horizontal positions when struck by a ball or one pin by another, each of said means including a rod secured to a pin composed of sections, a ball and socket joint connecting the sections of the rod, a bracket secured on the pin frame and having elongated opening to freely receive the rod, a pivotal mounting for said rod on the pin frame, a ball carried by said rod, a spring influenced plunger pivotally and slidably mounted on the pin frame and having a socket to receive the ball, and adapted to assume a vertical position slightly past dead center for retaining the rod vertically and capable of swinging when the pin of said rod is struck a blow to move past dead center position and exert a force on the rod to elevate the pin connected thereto into a substantially horizontal position.

2. In a bowling alley, a playing floor having a ball return trough and pins, a supporting structure at the pin end of the floor, a pin frame carried by the supporting structure and arranged over the floor, a plurality of pin suspending and elevating devices carried by the pin frame whereby the pins may be suspended in playing position over the floor and elevated into substantially horizontal positions when struck by a ball or one pin by another, each of said means including a rod secured to a pin composed of sections, a ball and socket joint connecting the sections of the rod, a bracket secured on the pin frame and having elongated opening to freely receive the rod, a pivotal mounting for said rod on the pin frame, a ball carried by said rod, a spring influenced plunger pivotally and

slidably mounted on the pin frame and having a socket to receive the ball, and adapted to assume a vertical position slightly past dead center for retaining the rod vertically and capable of swinging when the pin of said rod is struck a blow to move past dead center position and exert a force on the rod to elevate the pin connected thereto into a substantially horizontal position, arms pivotally mounted on the pin frame and engaging said rod from an elevated position downwardly to assume vertical position with the pins carried thereby positioned over the floor, and means for operating said arms.

3. In a bowling alley, a playing floor having a ball return trough and pins, a supporting structure at the pin end of the floor, a pin frame carried by the supporting structure and arranged over the floor, a plurality of pin suspending and elevating devices carried by the pin frame whereby the pins may be suspended in playing position over the floor and elevated into substantially horizontal positions when struck by a ball or one pin by another, each of said means including a rod secured to a pin composed of sections, a ball and socket joint connecting the sections of the rod, a bracket secured on the pin frame and having an elongated opening to freely receive the rod, a pivotal mounting for said rod on the pin frame, a ball carried by said rod, a spring influenced plunger pivotally and slidably mounted on the pin frame and having a socket to receive the ball and adapted to assume a vertical position slightly past dead center for retaining the rod vertically and capable of swinging when the pin of said rod is struck a blow to move past dead center position and exert a force on the rod to elevate the pin connected thereto into a substantially horizontal position, arms pivotally mounted on the pin frame and engaging said rod from an elevated position downwardly to assume vertical position with the pins carried thereby positioned over the floor, a series of rods pivotally connected to said arms, a bar slidably mounted on the supporting structure and slidably receiving said rods, yieldable drive means connecting the rods to said bar, and means for imparting sliding movement to the bar for effecting operation of said arms to release the pins from elevated position.

5. In a bowling alley, a playing floor and pins, a supporting structure at the pin end of said floor, pin supporting means carried by said supporting structure and connected to said pins for suspending the latter over the floor in playing position and adapted to elevate a pin when struck a blow and to retain the latter pin elevated in a substantially horizontal position, a releasing means carried by the supporting structure and operatively connected with said first means for effecting release of the pins from substantially horizontal position and including a slidable bar on the supporting structure, a cam shaft journaled on the supporting structure, a driven shaft journaled on the supporting structure, power means connected to the driven shaft, a cam secured to the cam shaft, a roller connected to said bar and riding said cam for imparting sliding movement to the bar during the rotation of the cam, and a manually controlled clutch for connecting and disconnecting the cam shaft with the driven shaft.

5. In a bowling alley, a playing floor and pins, a supporting structure at the pin end of said floor, pin supporting means carried by said supporting structure and connected to said pins for suspending the latter over the floor in playing position and adapted to elevate a pin when struck a blow and to retain the latter pin elevated in a substantially horizontal position, a releasing means carried by the supporting structure and operatively connected with said first means for effecting release of the pins from substantially horizontal position and including a slidable bar on the supporting structure, a cam shaft journaled on the supporting structure, a driven shaft journaled on the supporting structure, power means connected to the driven shaft, a cam secured to the cam shaft, a gear secured to the cam shaft, a gear meshing with the first gear and journaled on the driven shaft, a clutch for connecting and disconnecting the second gear with the driven shaft, an operating lever for said clutch, manual means connected with said lever for effecting operation thereof.

6. In a bowling alley, a playing floor and pins, a supporting structure at the pin end of said floor, pin supporting means carried by said supporting structure and connected to said pins for suspending the latter over the floor in playing position and adapted to elevate a pin when struck a blow and to retain the latter pin elevated in a substantially horizontal position, a releasing means carried by the supporting structure and operatively connected with said first means for effecting release of the pins from substantially horizontal position and including a slidable bar on the supporting structure, a cam shaft journaled on the supporting structure, a driven shaft journaled on the supporting structure, power means connected to the driven shaft, a cam secured to the cam shaft, a roller connected to said bar and riding said cam for imparting sliding movement to the bar during the rotation of the cam, a gear secured to the cam shaft, a gear meshing with the first gear and journaled on the driven shaft, a clutch for connecting and disconnecting the second gear with the driven shaft, an operating lever for said clutch, manual means connected with said lever for effecting operation thereof, spring means connected to said lever for normally positioning the latter to disengage the clutch, a timing disc secured on the cam shaft and having a socket, a pin carried by said lever and riding the timing disc to enter the socket for permitting said spring means to disengage the clutch and thereby bring about timing of the cam to be driven each time of the engagement of the clutch one complete revolution.

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