May 6, 1952 A. M. SIMPSON 2,595,988

PIN-RESETTING MECHANISM

Filed April 3, 1948 5 Sheets-Sheet 1

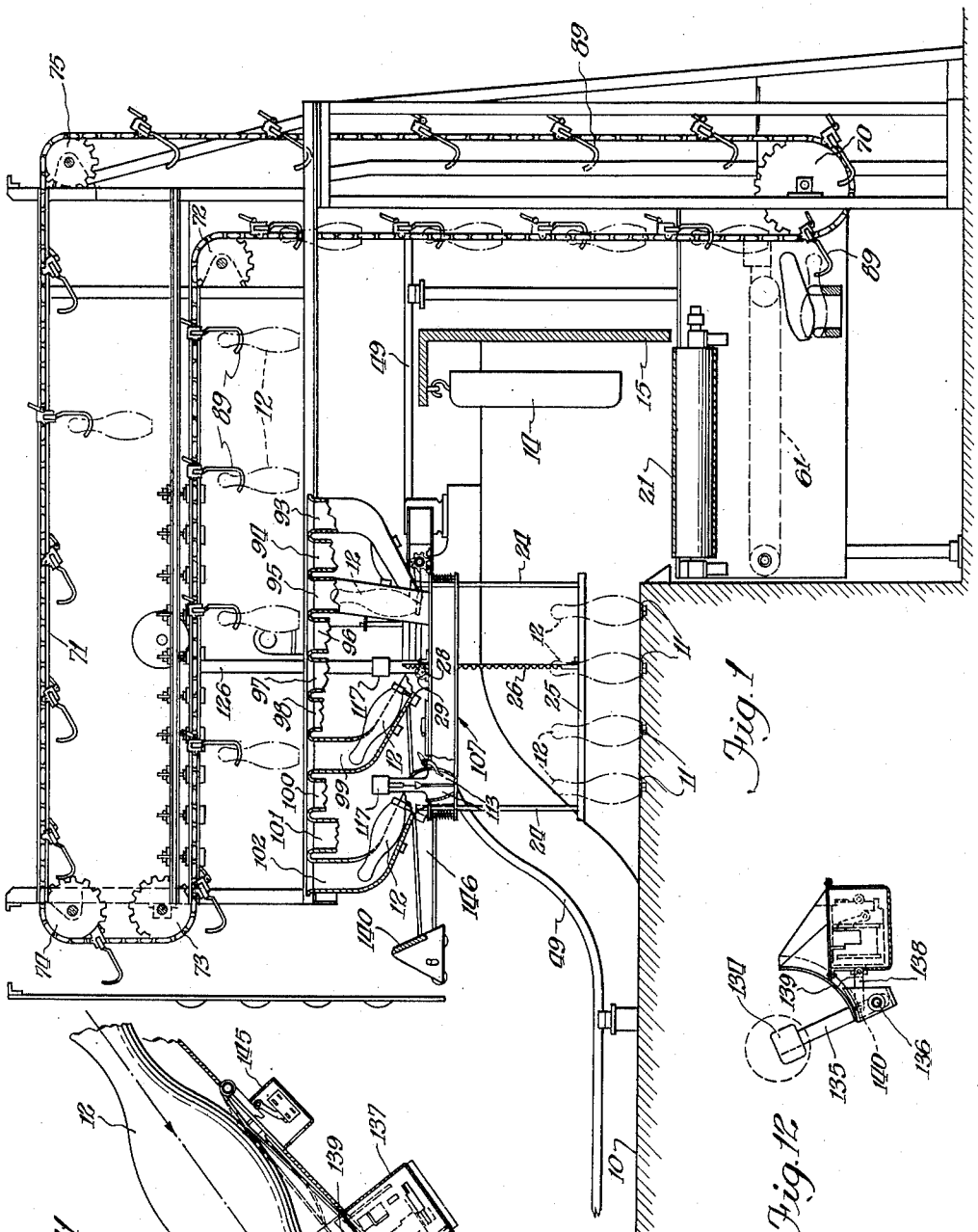


Fig. 1

Fig. 12

Fig. 11

Inventor:
Arthur M. Simpson
By: Clarence J. Loftus
Attorney.

May 6, 1952 A. M. SIMPSON 2,595,988

PIN-RESETTING MECHANISM

Filed April 3, 1948 5 Sheets-Sheet 2

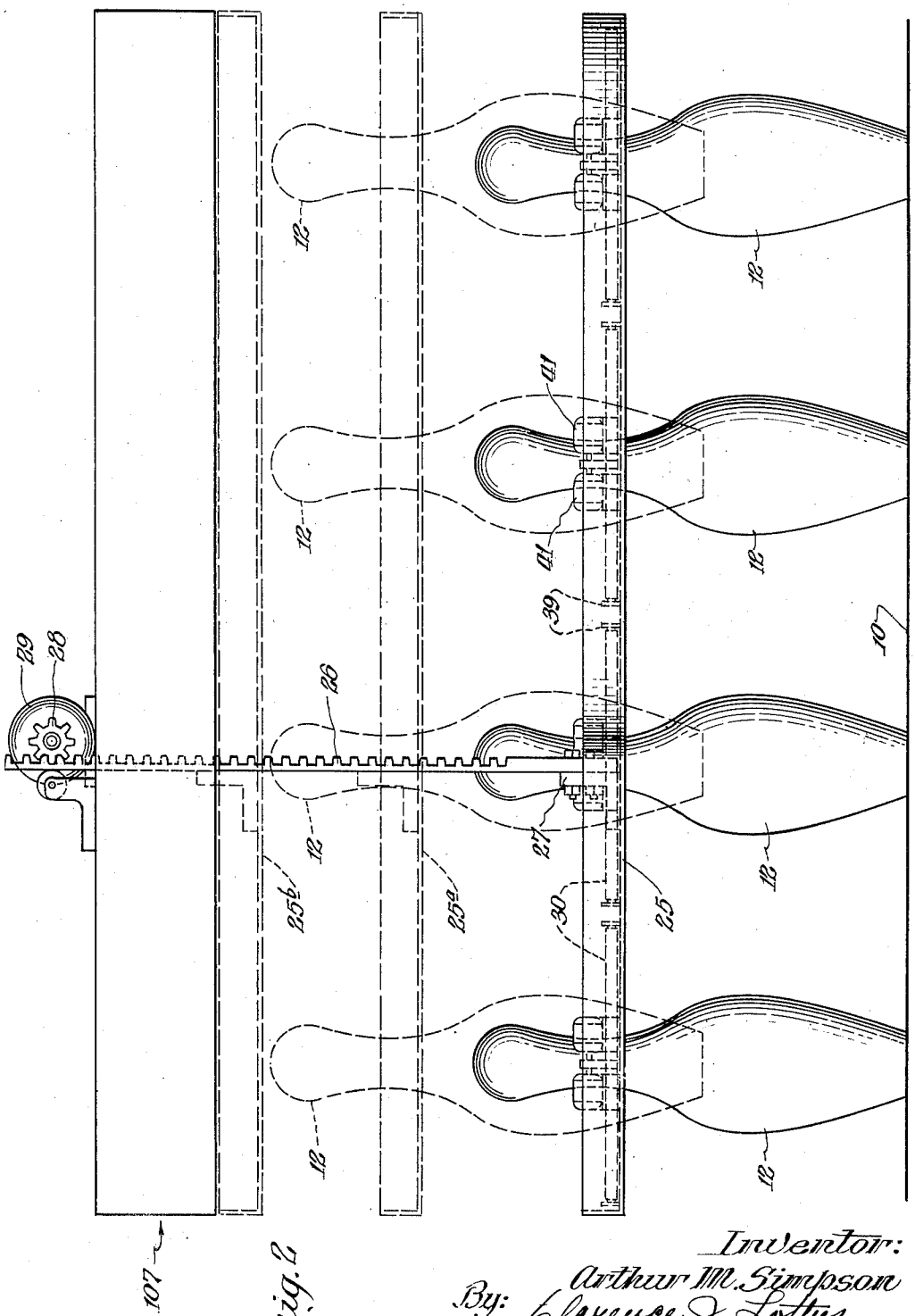


Fig. 2

Inventor:
Arthur M. Simpson
By: Clarence J. Loftus
Attorney.

May 6, 1952 A. M. SIMPSON 2,595,988

PIN-RESETTING MECHANISM

Filed April 3, 1948 5 Sheets-Sheet 3

Fig. 3

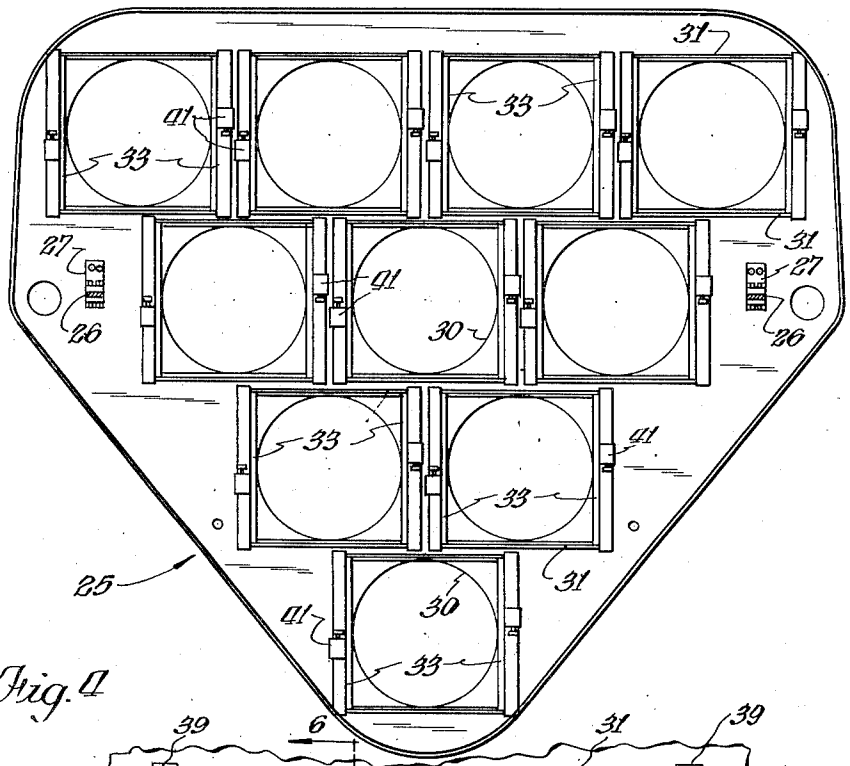
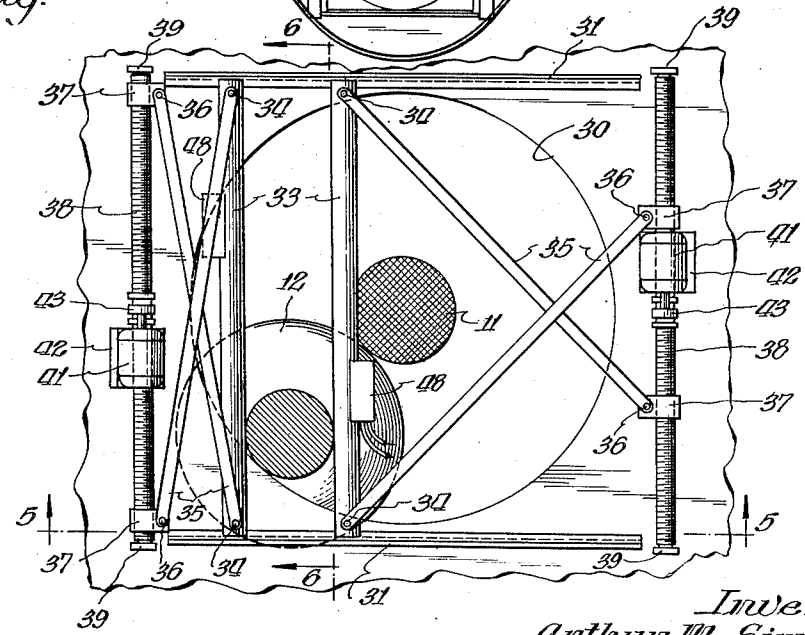


Fig. 4

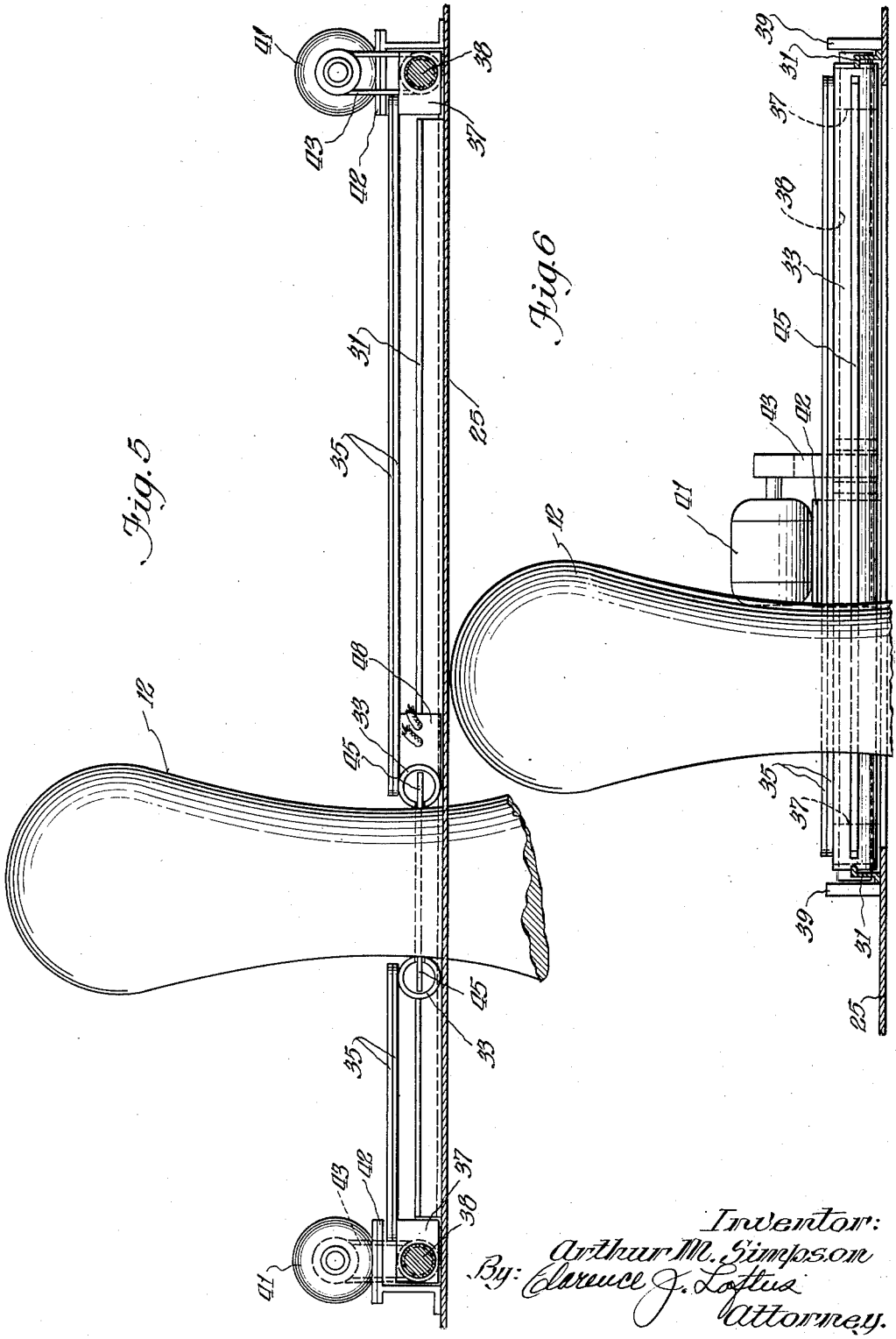


Inventor:
Arthur M. Simpson
By: Clarence J. Loftus.
Attorney.

May 6, 1952 A. M. SIMPSON 2,595,988

PIN-RESETTING MECHANISM

Filed April 3, 1948 5 Sheets-Sheet 4



Inventor:
Arthur M. Simpson
By: Clarence J. Loftus
Attorney.

May 6, 1952 A. M. SIMPSON 2,595,988

PIN-RESETTING MECHANISM

Filed April 3, 1948 5 Sheets-Sheet 5

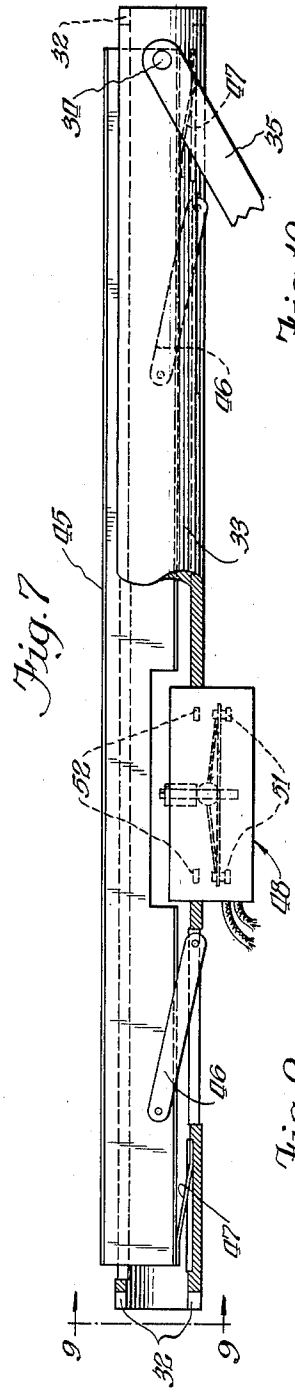


Fig. 7

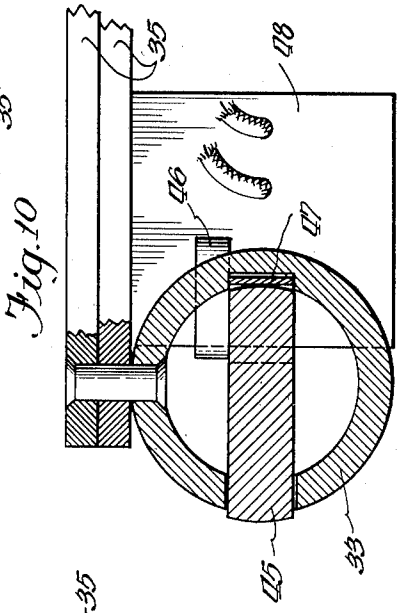


Fig. 10

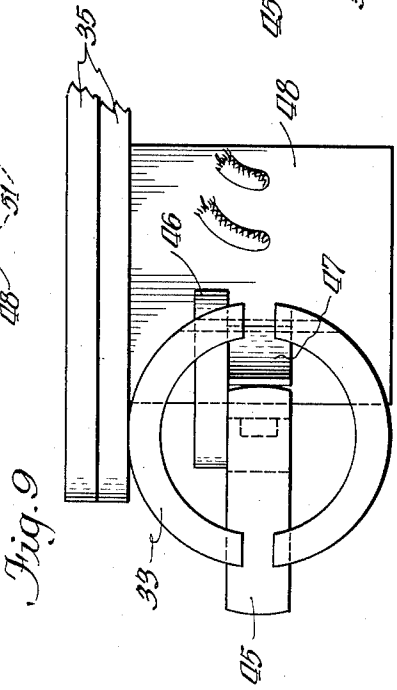


Fig. 9

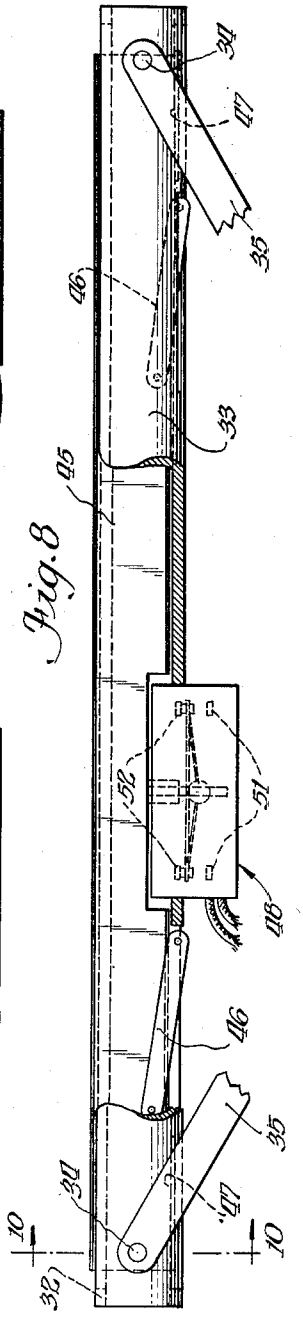


Fig. 8

Inventor:
Arthur M. Simpson
By: Clarence J. Loftus
Attorney.

Patented May 6, 1952

2,595,988

UNITED STATES PATENT OFFICE

2,595,988

PIN-RESETTING MECHANISM

Arthur M. Simpson, Lexington, Ky., assignor to The Kawneer Company, Niles, Mich., a corporation of Michigan

Application April 3, 1948, Serial No. 18,806

8 Claims. (Cl. 273—43)

1

The present invention relates to an automatic pin-setting mechanism for bowling alleys, and deals with the solution of the specific problem of resetting the pins left standing after the first ball of each frame. The invention is particularly directed to the provision of an "off-spot" resetting mechanism, so that in the event that one or more of the pins are struck by the first ball in such a manner as to knock them slightly off of their designated spots, yet not overturn them, they will be replaced in the exact positions at which they came to rest. This is accomplished by the expedient of a resetting frame carrying a plurality of pin gripping devices adapted to pick up a standing pin from any point within a reasonable range of its original spot, whereby all pins left standing, including any coming to rest in an off-spot position, will be lifted from the surface of the alley to permit the overturned pins to be swept into the pit, and will then be replaced in the precise positions they each occupied.

The applicant is aware that various attempts have been made to solve the problems involved in accomplishing this result, but is also aware that despite the numerous efforts, no successful device has heretofore been introduced to the trade. The reasons for this are manifold, and while no effort will be made to enumerate the various defects of prior devices, a full appreciation of the contribution of the present inventor requires some knowledge of the shortcomings of prior mechanisms which either (*a*) attempt to position the pin lifting mechanism by forcing an inverted funnel down over the pin, with the result that the pins are overturned or so shifted that the devices fail to reset pins in position accurately, or (*b*) interfere with the original pin-setting and storage devices and slow down the play beyond practical limits.

It is the primary object of the invention to provide an off-spot pin-setting mechanism, arranged to coact with a primary pin-setting carriage and secondary pin storage devices through which pins are delivered to the carriage, so that the functioning of the pin resetting device will accomplish its purpose quickly and with precise accuracy, yet will not interfere with the working of the original pin-setting and storage mechanism. This means that the high speed operation characteristic of pin-setting devices, including primary and secondary pin storage devices of the type disclosed and claimed in my copending application, Serial No. 727,209, filed February 7, 1947, is in no sense lessened but is, in fact, increased to permit maximum speed of operation,

2

whereby the device is suited to use on a busy alley and capable of permitting maximum play.

Another object of the invention is to provide a resetting device adapted to lift pins by the narrow portion of the pin neck. This avoids the faults inherent in any mechanism exerting a cam action on the head of the pin, allows the pins to hang downwardly in straight, erect positions, so that they are replaced with precision, allows the resetting mechanism to be positioned below the primary setting carriage and yet affords ample clearance between the resetting device and the surface of the alley, and uses the smallest possible diameter of the pin to lift it, so that the grasping devices operate at the point of maximum space between the pins and the area of the zone in which respotting can be done is materially increased.

A further object of the invention resides in the provision of a pin resetting mechanism having grasping devices adapted to advance across each pin position to engage any of the pins left standing after the first ball of the frame, with sensing means to interrupt the movement of the grasping devices independently as each of the devices engage the pin; so that the grasping devices will not overturn nor move the pins, but will engage them in the exact position wherein they have come to rest.

A preferred embodiment of the inventive thought is disclosed in the following specification and the drawings wherein:

Figure 1 is a central sectional view of an automatic bowling alley mechanism, including a bowling alley of standard design and construction, together with a pin elevator, pin sweeping device, ball return and pin-setting mechanism having primary and secondary pin storage facilities; together with the off-spot pin-resetting devices with which this disclosure is specifically concerned;

Figure 2 is a side elevational view of the auxiliary pin-resetting frame as contemplated by the present teaching, showing the relationship between the resetting frame of the present device and the primary pin-setting carriage employed in my earlier application;

Figure 3 is a plan view of the off-spot pin-resetting frame, as employed by the present invention;

Figure 4 is an enlarged plan view of one of the pin grasping mechanisms of the assembly of Figure 2;

Figure 5 is a detail sectional view taken sub-

stantially on the plane of the line 5—5 of Figure 4;

Figure 6 is a detail sectional view at right angles to Figure 5 and is taken substantially on the plane of the line 6—6 of Figure 4;

Figure 7 is a plan view, partly in section, of one of the gripping rods of the mechanism, showing the relationship between the gripping rod and the sensing strip carried thereby;

Figure 8 is a view similar to Figure 7 in a changed position;

Figure 9 is a detail end view of one of the gripping rods and may be considered as taken on the plane of the line 9—9 of Figure 7;

Figure 10 is a detail sectional view taken substantially on the plane of the line 10—10 of Figure 8;

Figure 11 is a detail view of the pin stop mechanism in one of the secondary storage chutes, and

Figure 12 is a detail sectional view taken substantially on the plane of the line 12—12 of Figure 11.

The mechanism contemplates a bowling alley 10 of conventional construction and is for the purpose of automatically resetting the pins 12 on their proper spots 11 at the end of the alley. The usual padded backstop 14 is positioned in front of the rear wall 15 to define a pit between the end of the alley and the rear wall, and a system of conveyor belts, represented by the belt 21, is mounted on the floor of the pit to collect the pins. The pins are moved to a second conveyor 61 from which they pass to any suitable elevator, such as generally represented at 71. As shown, this elevator includes a chain threaded over sprockets 70, 72, 73, 74 and 75. The chain carries a number of pin-lifting members, each of which has a pin-grasping fork 89 so that the pins are picked up from within the pit and carried to automatic tripping devices which serve to drop the pins individually into a series of chutes 93, 94, 95, 96, 97, 98, 99, 100, 101 and 102, each leading to one of ten pin sockets 113 in the pin-setting carriage 107. The pin sockets 113 thus serve as primary pin storage devices for the system, and each of the pin chutes is provided with a solenoid controlled stop so that they function as a secondary pin storage device after all of the sockets 113 are filled. This secondary storage mechanism, shown in Figures 11 and 12, is more fully described in my earlier disclosure, but includes a pin stop 134 mounted on an arm 135 pivoted at 136 to swing into or out of the path of a pin through the chute. The movement of the stop is controlled by a solenoid 137, the plunger of which is connected to the arm 135 by a link 138 extending between pivots 139 and 140. The solenoid 137 is energized through a contactor in the socket 113 at the end of the chute, so that the stop 134 is clear of the chute when the socket is empty. Thus the first pin entering the chute passes directly to the primary storage device (the socket 113 in carriage 107), and energizes the solenoid 137 to stop the next pin entering the chute in the secondary storage chamber in the chute itself. The weight of a pin 12 in the pin chute above one of the stops 134 rests on a switch lever 144 and actuates a switch 145 which is arranged to disengage the automatic tripping devices associated with the elevator chain, and thus prevent other pins from being dropped into a filled chute, until one setting operation has been completed and the pin in the chute has moved down to the socket 113. The sockets 113 lie in positions immediately above the several pin

spots 11 and are controlled by electrical solenoids 117, so that the pin-setting carriage may be bodily lowered on the shafts 126 to set the pins on the spots.

The present mechanism also contemplates the provision of some type of sweeping bar 140 which may be mounted on arms 146, and a ball hoist mechanism to deposit the ball on the inclined return track 49 so that it will roll back to the player in the usual manner.

The pin-resetting mechanism comprises an auxiliary frame 25 mounted on vertical slide rods 24 carried by and extending below the pin-setting carriage 107, and is arranged for vertical movement between a lowered position (illustrated in full line in Figure 2), an intermediate position 25a, and a raised position 25b immediately below the carriage 107. The frame may be raised and lowered by a pair of racks 26, secured to the frame by brackets 27 and extending upwardly to operative engagement with a pair of pinions 28 of lifting motors 29, carried by the pin-setting carriage 107. The frame 25 preferably consists of a relatively thin sheet metal plate, having a multiplicity of openings 30 corresponding to and positioned directly above the positions of the pin spots 11 on which pins 12 normally rest. The openings 30 are of considerably greater diameter than the pins, so that the neck portions of the individual pins may project through the openings of the plate when in its lowered position, even though the pin may be quite widely spaced away from the spot 11.

The mechanism with which the present invention is specifically concerned comprises means for grasping the neck of one of the pins at any position within the limitation of the opening 30, so that the pin will be lifted as the plate 25 is raised from its lowermost position into the intermediate position 25a and, after the down pins have been swept into the pit to clear the surface of the alley, will be replaced in the precise position it previously occupied. To this end each of the openings 30 is provided with a pin grasping mechanism comprising a pair of identical, but oppositely disposed, linkages each adapted to move a gripping bar across the opening until it engages the surface of the pin or, if no pin is there, engages the surface of the opposite gripping bar. To this end the plate is provided with a pair of Z-shaped slide bars 31, having their lower flanges secured to the plate 25 and their upper flanges entering slots 32 in the opposite ends of the gripping bars 33, so that the bars 33 are in sliding relationship between the slides 31 and may be moved across the openings 30 by a motor actuating a cross linkage. Each of the bars 33 is provided with pivots 34 at its opposite ends and a pair of links 35 extends from these pivots across each other and to pivots 36 carried on screw threaded fittings 37 of a rotatable screw 38. The screw is mounted for rotation in bearings 39, secured to the plate 25, and is oppositely threaded at its opposite ends; so that rotation in one direction brings the fittings 37 toward each other and rotation in the opposite direction draws them apart. The screws 38 may be driven in any convenient manner, as by the small torque motors 41, which are carried on brackets 42 to support them above the screws and are coupled to the screws by any suitable means, illustrated for convenience, as belt drive devices 43. Each of the bars 33 is slotted on the side opposite the links 35 and is provided with a sensing strip 45 extending substantially the entire length of the tube and held in parallelism

with the tube by a pair of parallel links 46 (Figure 7), so that it may move inwardly against the leaf springs 47, but will be maintained in parallel relationship with the surfaces of the tube (Figure 8). The sensing strip 45 is arranged so that when its leading edge engages the surface of the pin the strip will actuate an electrical switch 48, secured within the back wall of each of the tubes 33. As shown, the sensing strip is notched at the location of the switch to reduce the space required; and the switch is offset from the center of the bar sufficiently so that it may be fully withdrawn without striking the double screw mechanism or the motors driving it. As shown, the switch 48 includes two pairs of contacts 51 and 52, so that a circuit for advancing the bars 33 toward the pin may be completed through the contacts 51 until the sensing strip 45 strikes the pin and opens the switch. The contacts 52 are then closed, so that after the standing pins have been lifted and reset, a second circuit may be closed through the motors to drive them in reverse direction and withdraw the grasping mechanism from engagement in the necks of the standing pins.

In the operation of the device, the pins are set by lowering the carriage 107 to the surface of the alley and energizing the solenoids 117 of the sockets 113 to open all sockets and place a pin on each spot 11. During this time the pin resetting frame is held in position close against the bottom of the pin setting carriage 107 and performs no function. After the first ball, however, the lifting motors 29 are energized to lower the auxiliary frame 25 to its full line position (Figure 2), wherein the openings 30 assume positions over the necks of any of the pins remaining standing. The motors 41 are now energized to draw the fittings 37 toward each other, and these function through the links 35 to advance the bars 33 in parallel movement across each of the openings 30 until the bars 33 either engage the neck of a pin extending through the opening or strike the opposing bar. If a pin is standing in the opening, it will be engaged initially by the forward edge of one of the sensing strips 45. These are held forward by extremely light springs, however, so that they exert only a feather-like touch on the surface of the pin. Thus the pin is not displaced, but the movement of the tube 33 will flex the springs 47 sufficiently so that the sensing strip 45 will actuate the switch 48 to break the circuit through the contacts 51, stop the motor 41, and thus interrupt the motion of the gripping bar. In this connection, it will be understood that the pins are of substantial weight and the almost infinitesimal force required to cause the functioning of the sensing strip and switch will be insufficient to tip the pins or dislodge them from their precise position, whether on the spot 11 or in some off-spot position. Thus, if a given pin is closer to one side of the opening than to the other, it will first be contacted by the bar having the shorter distance to move and will immediately interrupt the movement of that bar, although the similar bar on the opposite side will continue to advance until it also engages the neck of the pin on the opposite side (Figure 4). It is also to be noted that even though the pin is in some off-spot position diagonal of its proper spot 11, yet it is nevertheless engaged at diametrically opposed points of its surface, so that when it is lifted there is no tendency for it to shift from its exact position with respect to the spot. Thus, it will be clear that the pins remaining standing after the first ball will be engaged on the opposite sides of the narrowest portion of the pin neck and, when the plate 25 is raised, will be lifted from the surface of the alley to the dotted line position of Figure 2. Since the gripping bars engage the pin neck at its narrowest point it is unnecessary for the bars to clamp against the surface of the pins with any degree of force to effect a firm grasp. On the contrary, they need merely to touch the opposite sides of the pin, as the weight of the pin and the tapering shape of the neck will cause it to be firmly gripped, as the rack moves upwardly.

After the rack has been lifted to the position 25*a*, the sweep bar 140 on the arms 146 is moved downwardly to the surface of the alley and drawn rearwardly across the pin spots to sweep any down pins into the pit. The sweep bar then returns to its original position, and the frame 25 is lowered to the full line position. A circuit is now completed through the contacts 52 to drive the motors 41 in reverse direction and withdraw the tubes 33 to their initial positions. This releases the pins, and the rack 25 may now be elevated to the position 25*b* immediately below the carriage 107. The alley is now in condition for the second ball of the frame.

From the foregoing, it will be apparent that the teachings of the present invention provide a means for accomplishing off-spot resetting of pins in a standard bowling alley by an automatic bowling alley mechanism, so that any pin which may have been knocked away from its original spot, but not actually overturned, is lifted as the down pins are swept from the alley and is replaced in the precise position from which it was lifted. This not only makes possible resetting pins in precise off-spot position, but further increases the utility of the mechanism by lifting the pins remaining standing upwardly from their spot positions and replacing them immediately after functioning of the sweep bar, so that it is entirely unnecessary to lower the main pin setting carriage 107 or release pins from the carriage before the second ball of the frame.

The form of the invention here disclosed and illustrated in the attached drawings represents the present preferred commercial embodiment of these teachings, but it will be apparent to those skilled in the art that various modifications in the precise structure shown may be resorted to without departing from the inventive concept, nor sacrificing all of the advantages inherent in the invention; and it is accordingly pointed out that the scope of the invention is not limited to the precise structure disclosed, but extends with equal force to any variation or modification thereof coming within the terms of the appended claims.

Having thus described the invention, what I claim as new and desire to protect by United States Letters Patent is:

1. In a pin-resetting mechanism for bowling alleys, in combination, a pin-setting carriage including primary pin storage devices; secondary pin storage devices above said carriage; means to shift said carriage between an upper loading position adjacent said secondary pin storage devices and a lower setting position close to the alley surface; a resetting frame under said carriage with openings in the frame whereby pins may be set through the frame by the setting devices of the carriage; said resetting frame being separate from and movable independently of

said carriage but normally positioned immediately below and in contact with the carriage and adapted to move with the carriage in the pin-setting operation; means to shift the resetting frame downwardy with respect to the carriage to bring the frame to a resetting position close to the alley surface while the carriage remains in its upper loading position; gripper means carried by the frame adjacent each of its openings to engage the neck of a pin thereunder, and means to lift the frame to an intermediate position while retaining the carriage in its upper loading position whereby the carriage may receive pins from the secondary storage means as the resetting operation progresses, and the pins standing on the alley are lifted from the surface of the alley and suspended from their necks to permit the down pins to be swept into the pit.

2. In a pin-resetting mechanism for bowling alleys, in combination, a pin-setting carriage, means to shift said carriage between an upper loading position and a lower setting position, and a resetting frame under said carriage with openings in the frame whereby pins may be set through the frame by the setting devices of the carriage; said resetting frame being separate from and movable independently of said carriage but normally positioned immediately below and in contact with the carriage and adapted to move with the carriage in the pin-setting operation; means to shift the resetting frame downwardly with respect to the carriage to bring the frame to a resetting position close to the alley surface while the carriage remains in its upper loading position; gripper means carried by the frame adjacent each of its openings and constructed and arranged to grasp the necks of the standing pins at any point within a zone around the pin spot and to suspend the pins by their necks above the alley, to permit the down pins to be swept into the pit and to thereafter reset the suspended pins in the precise positions from which they were lifted.

3. In an automatic pin-setting mechanism for bowling alleys, in combination, a pin-setting carriage; means to shift said carriage between an upper loading position spaced substantially above the alley surface and a setting position closely adjacent the alley surface; a pin-resetting mechanism including a frame positioned immediately below the pin-setting carriage with apertures in said frame through which pins from the carriage may be set on the alley; means to move said frame downwardly with respect to the carriage to a resetting position adjacent the level of the necks of pins standing in the alley; gripping means on said resetting frame constructed and arranged to engage pins standing thereunder; means to raise said resetting frame and retain it in an intermediate position above the resetting position but spaced below the pin-setting carriage to suspend the pins gripped thereby above the surface of the alley and permit the down pins to be swept into the pit; and means to thereafter lower said resetting frame and release the gripping means thereof to reset the suspended pins on the alley surface.

4. In an automatic pin-setting mechanism for bowling alleys, in combination, a pin-setting carriage; means to shift said carriage between a setting position immediately above the alley surface and a loading position spaced substantially above the alley surface; an auxiliary pin-resetting mechanism including a frame normally positioned immediately below the pin-setting carriage with apertures in said frame through which pins from the carriage may be set on the alley; means to move said frame downwardly from the carriage to position the frame at a point adjacent the neck portions of the pins standing on the alley while the carriage remains in its loading position; gripper means on the resetting frame to engage the necks of standing pins at any point within a zone around each of the pin spots; said gripper means comprising a pair of gripping bars each adapted to engage the neck of a pin; each gripping bar having a separate and independently operable mechanism including a screw threaded device to advance it toward the pin neck whereby the bars move toward the pin from two opposite sides, and each moves independently of the motion of the other; means to interrupt the advancing movement of the individual gripping bars, and means to raise the resetting frame to an intermediate position above the height of a pin and substantially below the loading position of the setting carriage to lift the standing pins from the surface of the alley to permit the down pins to be swept into the pit, and means to thereafter lower said frame and release said gripper means to reset the pins left standing in the precise positions from which they were lifted.

5. In an automatic pin-setting mechanism for bowling alleys, in combination, a pin-setting carriage including primary pin storage devices; means to convey pins from the pit of the alley to the pin-setting carriage including secondary pin storage means; an auxiliary pin-resetting mechanism including a frame positioned below the pin-setting carriage with apertures in said frame through which pins from the carriage may be set on the alley; means to move said frame downwardly from the carriage to a point adjacent to the pins standing on the alley; gripper means on the resetting frame to engage standing pins at any point within a zone around each of the pin spots; said gripper means comprising a plurality of gripping bars each adapted to engage the neck of a pin; each gripping bar having a separate and independently operable mechanism to advance it toward the pin neck whereby the bars move toward the pin from different sides, and each moves independently of the motion of the other; sensing means comprising a contact strip positioned in the leading edge of each of the bars to bear against the surface of the pin at the moment of engagement; means responsive to the actuation of each of the contact strips to interrupt the advancing movement of the individual gripping bar by which it is carried; and means to raise and lower the resetting frame to lift the standing pins from the surface of the alley to permit the down pins to be swept into the pit, and to thereafter reset the pins left standing in the precise positions from which they were lifted.

6. In an automatic pin-setting mechanism for bowling alleys, in combination, a pin-setting carriage including primary pin storage means holding one pin for each pin position of the alley, secondary pin storage mechanism above said carriage holding one additional pin for each pin position; means to shift said carriage between an upper loading position immediately below said secondary storage means and a setting position spaced substantially below said secondary storage means and closely above the alley surface; a pin-resetting mechanism including a frame positioned immediately below the pin-setting carriage with apertures in said frame through which

pins from the carriage may be set on the alley; means to move said frame downwardly with respect to the carriage to a resetting position adjacent the level of the necks of pins standing in the alley while the carriage is in its upper loading position wherein it may receive pins from said secondary storage means; gripping means on said resetting frame constructed and arranged to engage pins standing thereunder; means to raise said resetting frame and retain it in an intermediate position above the resetting position but spaced below the pin-setting carriage to suspend the pins gripped thereby above the surface of the alley and permit the down pins to be swept into the pit; and means to thereafter lower said resetting frame and release the gripping means thereof to reset the suspended pins on the alley surface.

7. In an automatic pin-setting mechanism for bowling alleys, in combination, a pin-setting carriage including primary pin storage means holding one pin for each pin position of the alley, secondary pin storage mechanism above said carriage holding one additional pin for each pin position; means to shift said carriage between an upper loading position immediately below said secondary storage means and a setting position spaced substantially below said secondary storage means and closely above the alley surface; a pin-resetting mechanism including a frame positioned immediately below the pin-setting carriage with apertures in said frame through which pins from the carriage may be set on the alley; means to move said frame downwardly away from the carriage and position the apertures therein over the necks of pins standing in the alley while the carriage is in its upper loading position wherein it may receive pins from said secondary storage means; gripping means on said resetting frame comprising a plurality of gripping bars each adapted to engage the neck of a pin; each gripping bar having a separate and independently operable mechanism to advance it toward the pin neck whereby the bars move toward the pin from different sides, and each moves independently of the motion of the other; sensing means comprising a contact strip positioned in the leading edge of each of the bars to

bear against the surface of the pin at the moment of engagement; means responsive to the actuation of each of the contact strips to interrupt the advancing movement of the individual gripping bar by which it is carried; and means to raise and lower the resetting frame to lift the standing pins from the surface of the alley to permit the down pins to be swept into the pit, and to thereafter reset the pins left standing in the precise positions from which they were lifted.

8. In an automatic pin-setting mechanism for bowling alleys, in combination, a pin-setting carriage; means to shift said carriage between an upper loading position spaced substantially above the alley surface and a setting position closely adjacent the alley surface; a pin-resetting mechanism including a frame positioned immediately below the pin-setting carriage with apertures in said frame through which pins from the carriage may be set on the alley; means to move said frame downwardly with respect to the carriage to a resetting position adjacent the level of pins standing in the alley; gripping means on said resetting frame constructed and arranged to engage pins standing thereunder; means to raise said resetting frame and retain it in an intermediate position above the resetting position but spaced below the pin-setting carriage to suspend the pins gripped thereby above the surface of the alley and permit the down pins to be swept into the pit; and means to thereafter lower said resetting frame and release the gripping means thereof to reset the suspended pins on the alley surface.

ARTHUR M. SIMPSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,584,030	Gray	May 11, 1926
1,896,384	White et al.	Feb. 7, 1933
2,283,613	Schmidt	May 19, 1942
2,300,802	Parra et al.	Nov. 3, 1942
2,353,189	Rundell	July 11, 1944