Oct. 20, 1953 W. BLAIR 2,656,187

PIN SWEEPING DEVICE

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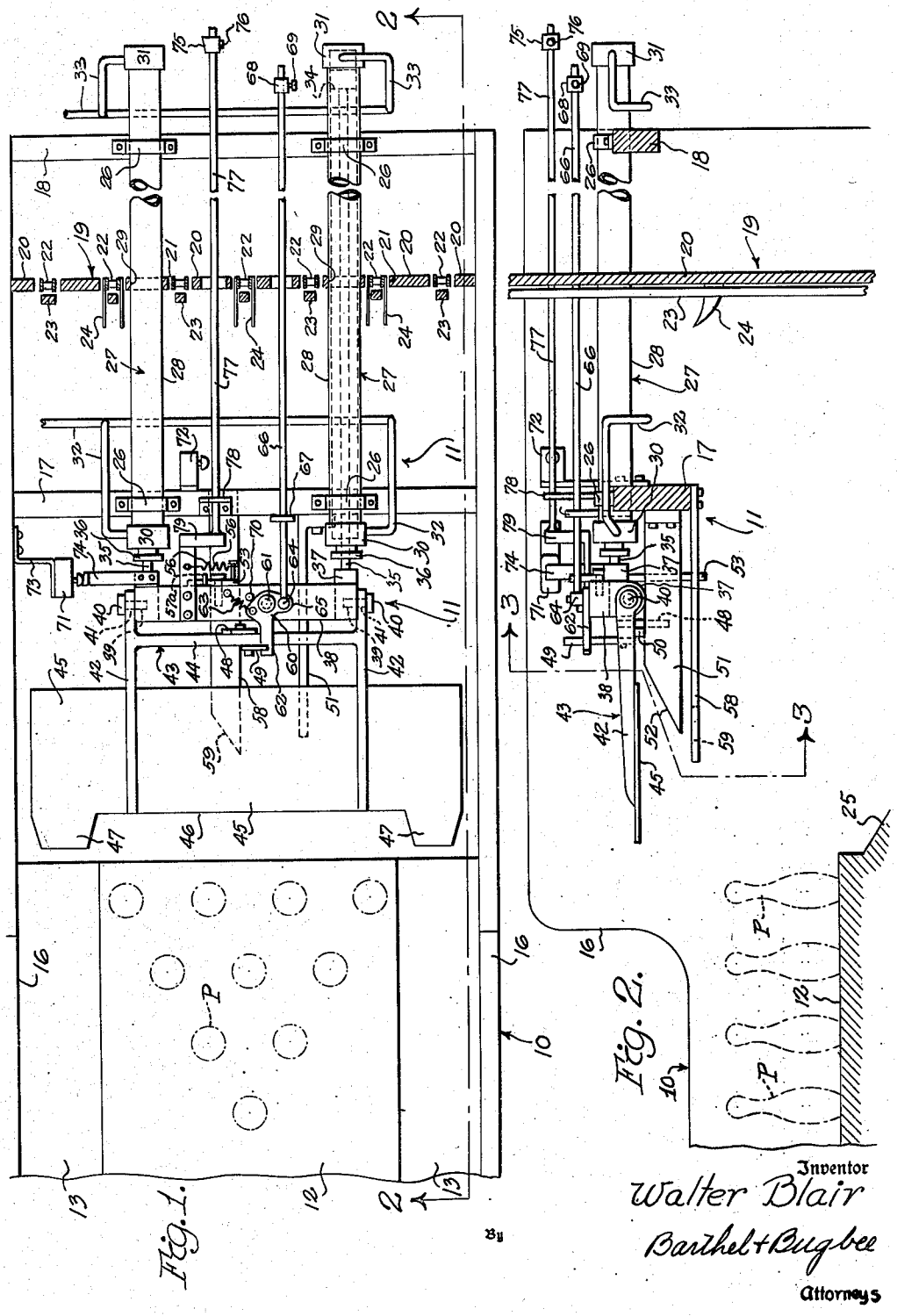


Fig. 1.

Fig. 2.

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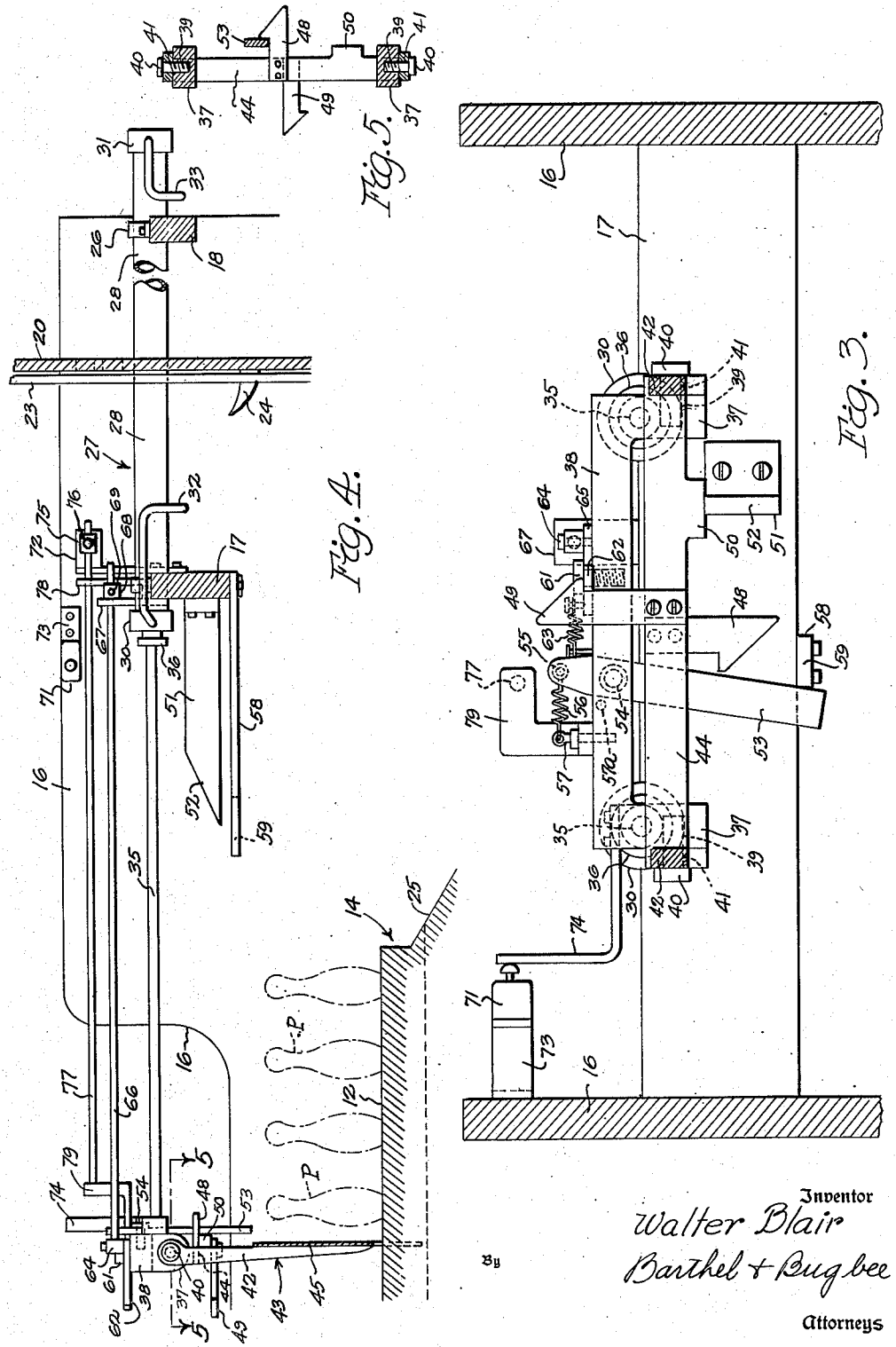


Fig. 5.

Fig. 4.

Fig. 3.

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PIN SWEEPING DEVICE

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3 Claims. (Cl. 273—54)

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This invention relates to bowling apparatus, and in particular to pin-sweeping devices for sweeping the fallen pins or "dead wood" off the bowling alley.

In bowling apparatus, especially automatic pin-setting machines, the sweeping of the fallen pins or "dead wood" off the alley has presented a number of difficult problems. It has been necessary to position the sweeping device in such a location that it will not interfere with bowling operations and will not be damaged by being hit by bowling balls or flying pins. The sweeping device must be drawn toward the rear of the alley or pit in order to sweep the fallen pins into the pit, but it must advance over the fallen pins or over the pins remaining standing at the conclusion of bowling without contacting such pins. Hitherto, it has been difficult to provide a pin-sweeping device which will overcome these problems or meet these conditions of operation, and at the same time be dependable in operation and compact in the amount of space which it occupies. Certain of these pin sweeping devices employed tilting reciprocating motors which involved complicated and delicate mechanisms. The present invention provides a pin sweeping device which satisfies these conditions and solves these problems.

One object of this invention is to provide a bowling pin sweeping device for removing the fallen or standing pins from the alley, the sweep being operated by a reciprocating motor such as a fluid pressure piston so arranged that when the piston has been advanced a predetermined distance, the sweep, which during such advancement has been moving forward in a horizontal position, now drops into a vertical position and is locked in that position while being retracted, sweeping the pins from the alley into the pit.

Another object is to provide a bowling pin sweeping device of the foregoing character wherein the sweep is automatically unlocked when it has been retracted to a predetermined position beyond the end of the alley and over the pit, continued retraction of the piston causing the sweep to be automatically swung upward from a horizontal position to a vertical position and automatically locked in that position, thereby eliminating any necessity for employing tiltable motor mechanism.

Another object is to provide a bowling pin sweeping device of the foregoing character wherein the pin sweep is locked in its horizontal and vertical positions by latches operated by fixed cams or by stop rods so that the location at which

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the locking and unlocking takes place is exactly regulated and positively actuated.

Another object is to provide a bowling pin sweeping device of the foregoing character wherein the pin sweep upon being unlocked near the end of its retraction stroke in its vertical position is immediately thereafter moved upward to its horizontal position by engagement with a fixed cam, thus insuring that the sweep is locked in its horizontal position when it reaches its fully retracted position and remains locked in this horizontal position until it reaches its fully advanced position.

In the drawings:

Figure 1 is a top plan view of a bowling pin sweeping device in its retracted and raised position, according to one form of the invention, as installed in a bowling alley having a chain-operated pin elevator associated therewith;

Figure 2 is a side elevation, partly in section, of the bowling pin sweeping device shown in Figure 1, taken along the line 2—2 in Figure 1;

Figure 3 is a cross-section taken along the line 3—3 in Figure 2, showing the major portion of the pin-sweeping device in front elevation;

Figure 4 is a vertical section, similar to Figure 2, but showing the pin sweeping device in its advanced and lowered position; and

Figure 5 is a horizontal section taken along the line 5—5 in Figure 4, showing the latching arrangement for releasably locking the sweep in its lowered or vertical position.

Referring to the drawings in detail, Figure 1 shows a bowling alley, generally designated 10, in which a bowling pin sweeping device, generally designated 11, has been installed, according to one form of the invention. The bowling alley 10 includes the usual alley bed 12 flanked on either side by gutters 13 and having the usual pit 14 behind it. The alley bed 12 is shown as having pins P arranged in the usual triangular pattern.

The bowling alley 10 beyond the gutters 13 is provided with side walls or side boards 16 which are interconnected by parallel forward and rearward cross members 17 and 18 respectively. The alley 10 is also shown as provided with a vertical pin elevator 19 forming a part of an automatic pin setting machine, the remainder of which is not shown. The portion of the pin elevator 19 which is shown in Figures 1, 2 and 4 consists of vertical bars 20 spaced laterally from one another by gaps 21 in which the forward courses of endless conveyor chains 22 run upward, guided by vertical guide bars 23 (Figure 1). The conveyor chains 22 at intervals along their lengths are pro-

vided with laterally spaced pin grasping fingers 24 which extend forwardly from the chain 22 past the guide bars 23 into positions where they will reach beneath the head and around the neck of a pin P which has been properly positioned with its head downward at the lower end of the pit bottom 25 (Figures 1 and 4). Neither the automatic pin setting machine nor the pin elevator 19 is within the scope of the present invention, such a pin-setting machine and elevator being disclosed and claimed in my co-pending application Serial No. 81,087 filed March 12, 1949, for Automatic Bowling Pin-Setting Machine. The portion of the pin elevator 19 shown in the present drawings is inserted merely for the purpose of showing the relative location of the pin sweeping device and also illustrating how the device may be installed in an automatic bowling pin-setting machine of the type disclosed and claimed in my copending application mentioned above.

Mounted on the upper edges of the cross members 17 and 18 are secured thereto by cleats or arcuate bands 26 are two reciprocable fluid pressure motors, generally designated 27, spaced laterally apart from one another (Figure 1). The motors 27 are preferably pneumatic motors having cylinders 28 extending through apertures 29 in certain of the vertical bars 20 and having forward and rearward cylinder heads 30 and 31 respectively provided with air conduits 32 and 33 for alternately supplying compressed air and discharging air. Reciprocably mounted in each cylinder 28 is a piston 34 (Figure 1) connected to a piston rod 35. The piston rods 35 pass outward through the forward heads 30 which are provided with glands 36 which compress packings (not shown) to prevent leakage of air around the piston rods 35. The piston rods 35 are thus constrained by their cylinders 28 to reciprocate in substantially rectilinear paths spaced above the tops of standing pins P on the alley 12 and substantially parallel to the alley 12.

Mounted on the forward ends of the piston rods 35 are the downwardly projecting legs 37 of an approximately U-shaped cross head 39 (Figure 3). The legs 37 are bored as at 39 and preferably also threaded to receive pivot pins or pivot screws or studs 40 which likewise pass through bores 41 in the side arms 42 of an H-shaped swinging pin sweep, generally designated 43, having a horizontal cross bar 44 interconnecting the side arms 42 (Figure 1). Secured to the lower portions of the side arms 42 and interconnecting the latter is a plate-like pin sweeping member 45 having a slightly cut away portion 46 along the central part of its lower or forward edge, depending upon its position (Figure 1). On either side of the cutaway portion 46, which passes close to the surface of the alley bed 12, are downward projections 47 which enter the gutters 13 and sweep therefrom any pins which may have been knocked into the gutters.

Secured as by fasteners to the opposite sides of the cross bar 44 (Figures 3 and 5) are two oppositely extending latch hooks 48 and 49. The cross bar 44 is also provided with a projection or lug 50 (Figures 2 and 3) adapted to engage the upper edge of a forwardly projecting L-shaped fixed cam 51 arranged in a vertical plane and having an inclined forward end 52 and secured at its rearward end to the cross member 17. The hook 48 when in its horizontal rearwardly extending position (Figures 4 and 5) is engaged by a swinging locking lever 53 which holds the pin sweep 43 in its vertical position. The locking lever 53 is pivoted as at 54 to the cross head 38 and has connected as at 55 to its upper end a tension spring 56 (Figure 3), the opposite end of which is anchored to a pin or screw 57 seated in an angle bracket 79 secured to the cross head 38. Thus, the lower portion of the locking lever 53 is constantly urged by the spring 57 toward latching engagement with the hook 48 (Figure 5) when the pin sweep 43 is vertical and its upper portion is urged toward a stop pin 57a by the spring 56 (Figures 1 and 3). The locking lever 53, however, is swung into unlocking position by a fixed cam 58 mounted in a horizontal plane and having an inclined forward end 59 (Figure 1) and secured at its rearward end to the lower edge of the cross member 17.

The pin sweep 43 is locked temporarily and releasably in its raised or horizontal position (Figures 1 and 2) by a bell crank latch lever 60 which is pivoted as at 61 to the upper surface of the cross head 38 and which has its forward arm 62 urged beneath the hook 49 (Figure 3) by a tension spring 63 extending from it to the cross head 38. Pivotally connected as at 64 to the rearward arm 65 of the bell crank lever 60 is a stop rod 66 which extends rearwardly through a suitably bored guide bracket 67 secured to and extending upwardly from the cross member 17. The stop rod 66 near its rearward end carries an adjustable stop collar 68 which may be clamped by the set screw 69 at any desired position along the stop rod 66. A stop pin 70 on the upper surface of the cross head 38 (Figure 1) limits the swinging of the bell crank latch lever 60.

In order to control the alternate supplying of compressed air to the conduits 32 and 33 at the forward and rearward ends of the pneumatic motors 27, an electro-magnetic valve (not shown) is provided, the energization of which is controlled by limit switches 71 and 72 (Figure 1). The limit switch 71 which is actuated in the retracted position of the pin sweep 43 (Figure 1) is mounted upon an angle bracket 73 bolted to one of the alley side walls 16. The limit switch 71 is engaged by a contact arm 74 of L-shaped form secured to and extending laterally from one of the legs 37 of the cross head 38. The limit switch 72, on the other hand, is actuated by a beveled stop collar 75 clamped by the set screw 76 at any desired position of adjustment along a switch-operating rod 77 which passes through a suitably bored guide bracket 78 secured to and extending upward from the cross member 17. The operating rod 77 at its forward end is connected to the angle bracket 79 (Figures 1 and 3) which is likewise bolted to the upper surface of the cross head 38.

Operation

In the operation of the invention, let it be assumed that there are pins P standing or lying on the alley bed 12 which it is desired to sweep into the pit 14, where the pins P may be either picked up and reset manually by the pin boy or picked up by the elevator conveyor fingers 24 and reset by a pin-setting machine. Let it also be assumed that the latter is the case, and that the limit switches 71 and 72 are electrically connected to the remainder of the circuit controlling and operating the pin-setting machine. Such a circuit is shown in my co-pending application Serial No. 82,087 previously referred to above. Let it finally be assumed that the pin sweeping device 11 is in its retracted position shown in Figures 1, 2 and 3 with the pin sweep 43 raised into its horizontal

position where it is held by the bell crank latch lever 60 engaging the hook 49 (Figures 1 and 3). At this time, the contact arm 74 is engaging the plunger of the limit switch 71, conditioning the circuit for operation as soon as the necessary preceding operations have been carried out, such as, for example, to pick up by an automatic pinsetter certain standing pins which it is desired to replace on the alley rather than to sweep them off.

When the circuit is energized so that electric current flows through the limit switch 71 to the electro-magnetic valve (not shown), the conduit 32 is thereby opened to the atmosphere and at the same time compressed air is caused to flow through the conduit 33 to the rearward end of the cylinders 28 of the fluid pressure motors 27, causing the pistons 34 and piston rods 35 to move forward to the left. As the pin sweep 43, now in its horizontal position (Figure 2), moves forward, the projection or lug 50 slides over the upper edge of the fixed cam 51, but it does not at this time slide down the inclined portion 52 because it is still locked in its horizontal or raised position by the bell crank latch lever 60 (Figure 1) engaging the hook 49.

When the pin sweep 43 nears the limit of its forward stroke, however, the stop collar 68 on the stop rod 66 comes into contact with the bracket 67 (Figure 1) and halts further motion of the stop rod 66. The piston rods 35, however, continue to push the pin pickup 43 forward, carrying with it the pivot pin 63 and the bell crank latch lever 60, with the result that the latter is caused to swing in a counterclockwise direction around the pivot pin 61, thereby swinging the arm 62 out from under the hook 49. This permits the pin sweep 43 to drop by gravity into a vertical position (Figure 4) after it has passed beyond any possible standing pins which are to be swept from the alley bed 12.

In the meantime, the locking lever 53 has moved along the edge of the horizontal fixed cam 58, over oblique end surface 59 and off the end thereof. This permits the locking lever 53 to be moved from its inclined position (Figure 3) to a vertical position against the stop pin 57a by the spring 56.

When the pin sweep 43 reaches its lowermost or vertical position, the hook 48 pushes the locking lever 53 aside (Figure 5) and the spring 56 then pulls the locking lever 53 back into locking position behind the prong of the hook 48, temporarily locking the pin sweep 43 in its vertical position (Figures 4 and 5).

When the pin sweep 43 and cross head 38 have been advanced forwardly to their extreme forward positions (Figure 4), the switch operating rod 77 has meanwhile been drawn sufficiently far to the left to cause the stop collar 75 to engage and operate the switch plunger of the limit switch 72. This action oppositely energizes the electromagnetic valve which controls the flow of compressed air to the pneumatic motors 27, causing compressed air to flow through the conduit 32 into the forward or left-hand ends of the cylinders 28 and opening the conduits 33 to the atmosphere. This causes the pistons 34 and piston rods 35 to move rearwardly to the right, retracting the now vertical pin sweep 43 and sweeping the pins P off the alley bed 12 into the pit 14.

When the pin sweep 43 nears the end of its retracted stroke, the lower portion of the locking lever 53 engages the beveled portion 59 of the horizontal fixed cam 58 and is pushed to one side (Figure 3) out from behind the prong of the hook 48 and thereby unlocking the hook 48 and pin sweep 43. Immediately thereafter, the projection 50 on the cross bar 44 of the pin sweep 43 encounters the beveled portion 52 of the vertical fixed cam 51, riding up this beveled portion 52 onto the upper edge thereof and thereby swinging the pin sweep 43 upward from its vertical position (Figure 4) to its horizontal position (Figure 2).

In the meantime, the disengagement of the stop collar 68 with the bracket 67 resulting from the rearward movement of the pin sweep 43 (Figure 1), permits the bell crank latch lever 60 to be drawn in a counterclockwise direction back against the stop pin 70 by the spring 63. As the pin sweep 43 is moved upward by the engagement of the projection 50 with the upper edge of the vertical cam 51, the hook 49 pushes its way past the arm 62 of the bell crank stop lever 60, pushing the latter aside, whereupon the spring 63 pulls the arm 62 back behind the prong of the hook 49 and temporarily locks the pin sweep 43 in its horizontal or raised position. Finally, when the pin sweep 43 and cross head 38 reach their extreme retracted position (Figures 1, 2 and 3), the contact arm 74 moves into engagement with the operating plunger of the limit switch 71, thereby causing shifting of the electromagnetic valve and halting the further retraction of the pin sweep 43. By actions elsewhere in the operating circuit, as described in my above-mentioned co-pending application Serial No. 81,087, the pin sweeping device 11 now remains stationary until it is next called upon to sweep pins from this alley.

In place of the operation of the pin sweeping device 11 by an electro-magnetic valve controlled by the limit switches 71 and 72, it will be understood that the pin sweeping device 11 may also be operated manually merely by shifting the air control valve manually, to reversely control the admission of compressed air to the conduits 32 or 33 as described above. This procedure would be used where the pin sweeping device 11 is used apart from an automatic pin-setting machine.

What I claim is:

1. A pin sweeping apparatus for a bowling alley, comprising a reciprocatory member reciprocably mounted above said alley, a reciprocatory fluid pressure motor having a reciprocable piston operatively connected to said member to reciprocate said member, a pin sweep pivotally mounted on said reciprocatory member and swingable thereon between approximately horizontal and vertical positions, a sweep retracting device responsive to the arrival of said sweep at a predetermined position in its rearward stroke for effecting raising of said sweep from its vertical to its horizontal position, a locking appliance arranged to temporarily lock said sweep in said vertical position, and releasing mechanism responsive to the arrival of said sweep at a predetermined position in its rearward stroke for unlocking said locking appliance.

2. A pin sweeping apparatus for a bowling alley, comprising a reciprocatory member reciprocably mounted above said alley, a reciprocatory fluid pressure motor having a reciprocable piston operatively connected to said member to reciprocate said member, a pin sweep pivotally mounted on said reciprocatory member and swingable thereon between approximately horizontal and vertical positions, a sweep retracting

device responsive to the arrival of said sweep at a predetermined position in its rearward stroke for effecting raising of said sweep from its vertical to its horizontal position, a first locking appliance arranged to temporarily lock said sweep in said horizontal position, a second locking appliance arranged to temporarily lock said sweep in said vertical position, a first releasing element responsive to the arrival of said sweep at a predetermined position in its forward stroke for unlocking said first locking appliance, and a second releasing element responsive to the arrival of said sweep at a predetermined position in its rearward stroke for unlocking said second locking appliance.

3. A pin sweeping apparatus for a bowling alley, comprising a reciprocatory member reciprocably mounted above said alley, a reciprocatory fluid pressure motor having a reciprocable piston operatively connected to said member to reciprocate said member, a pin sweep pivotally mounted on said reciprocatory member and swingable thereon between approximately horizontal and vertical positions, a stationary cam disposed in the path of travel of said sweep

for engagement therewith and responsive to the arrival of said sweep at a predetermined position in its rearward stroke for effecting raising of said sweep from its vertical to its horizontal position, a first locking appliance arranged to temporarily lock said sweep in said horizontal position, a second locking appliance arranged to temporarily lock said sweep in said vertical position, and a second stationary cam disposed in the path of travel of said locking appliance and responsive to the arrival of said sweep at a predetermined position in its rearward stroke for unlocking said second locking appliance.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,297,951	Wheeler	Mar. 18, 1919
1,586,831	Murphy	June 1, 1926
1,590,124	Roble	June 22, 1926
1,627,414	Schaffer	May 3, 1927
2,250,503	Rundell	July 29, 1941
2,319,925	Flanagan	May 25, 1943
2,580,853	Sherman	Jan. 1, 1952