Feb. 26, 1963 J. ZUERCHER 3,079,154

BOWLING PIN ELEVATING MECHANISM

Filed May 4, 1959

3 Sheets-Sheet 1

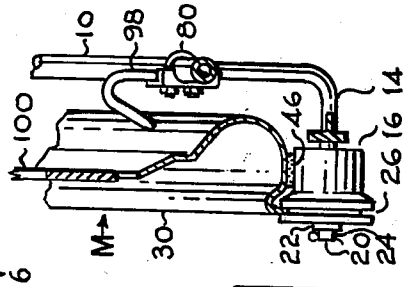

FIG. 3

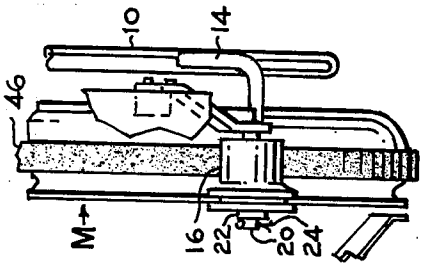

FIG. 4

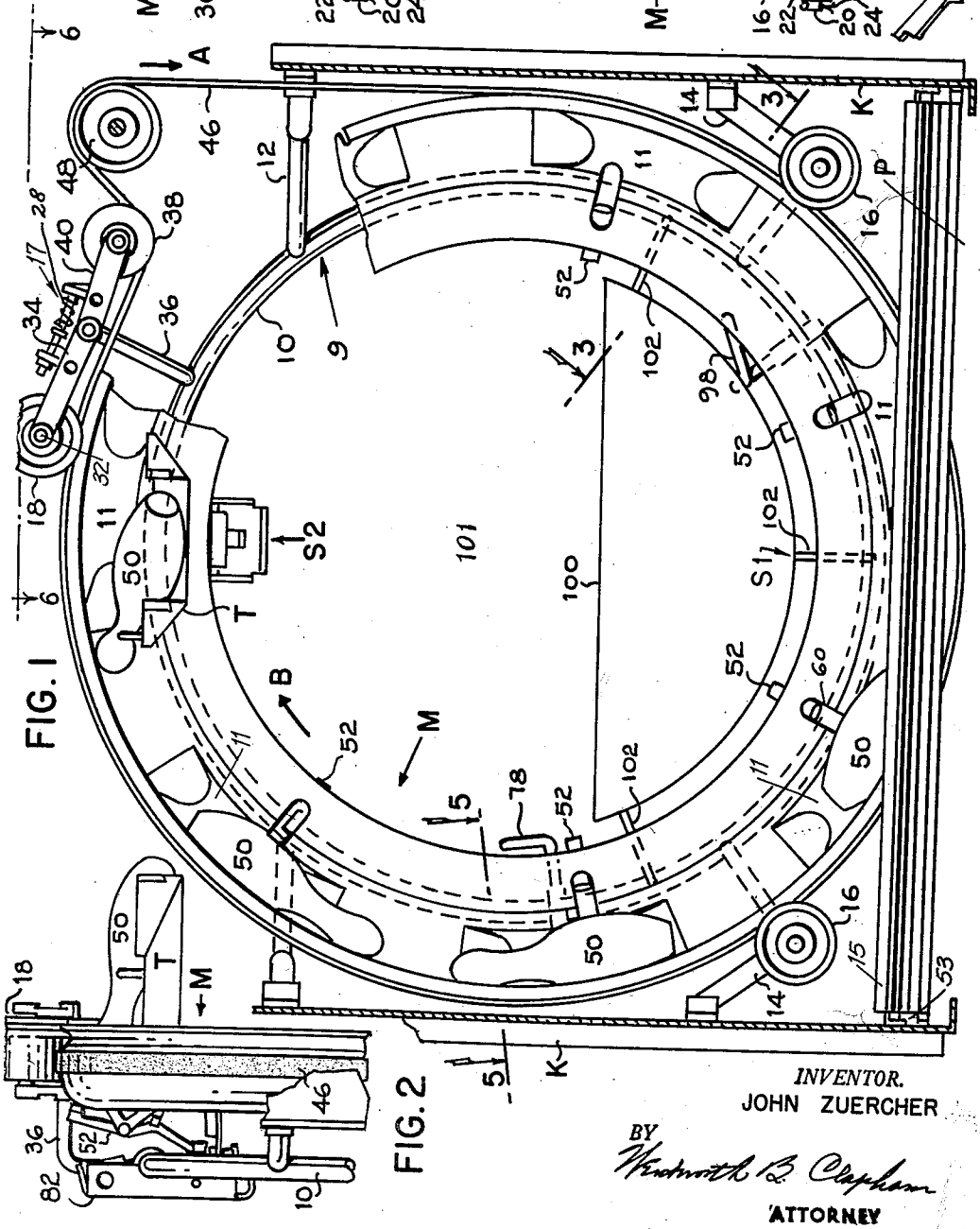

FIG. 1

FIG. 2

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Feb. 26, 1963 J. ZUERCHER 3,079,154

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Filed May 4, 1959 3 Sheets-Sheet 2

FIG. 5

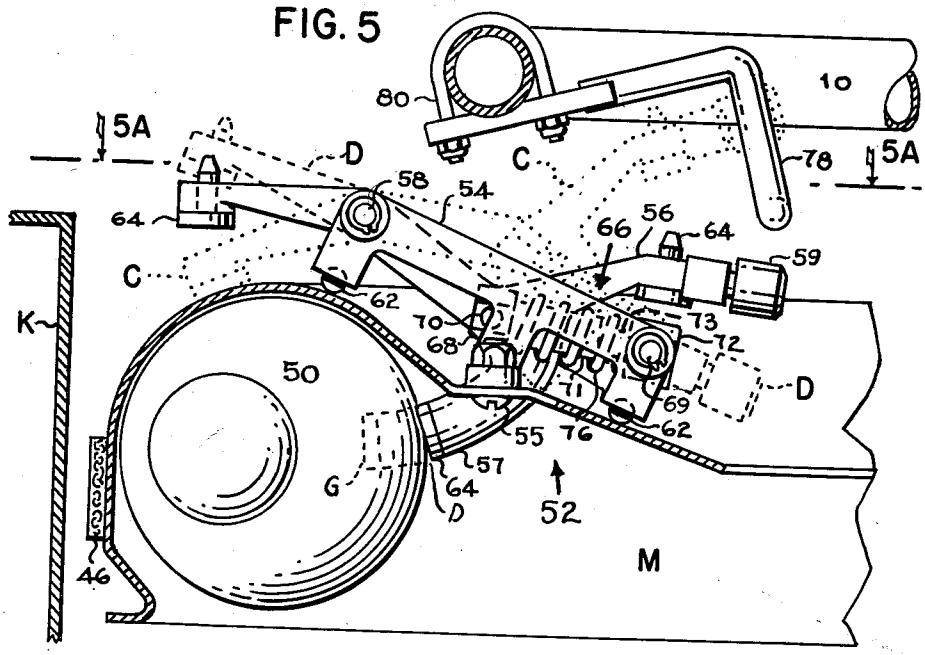


FIG. 6

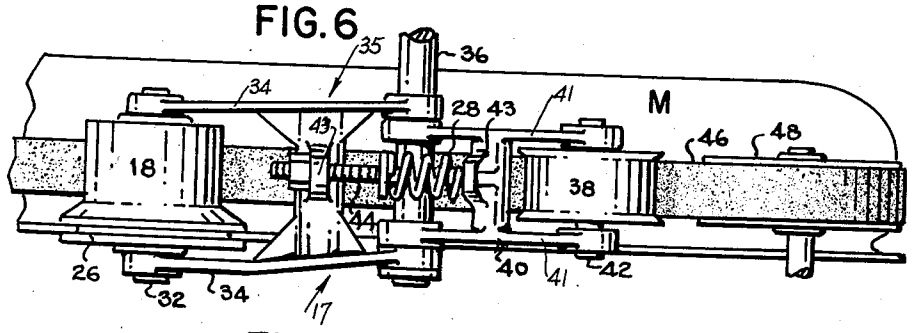
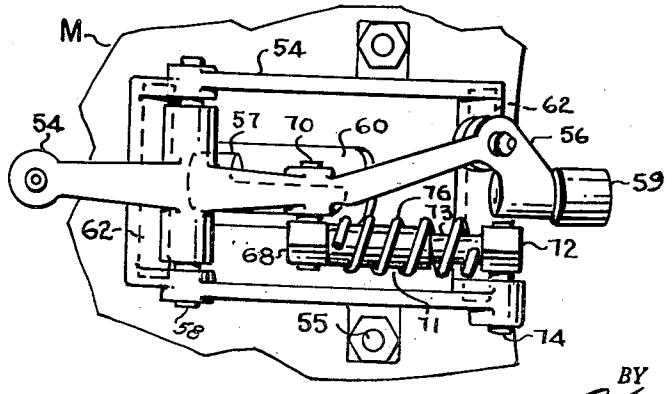


FIG. 5A



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BOWLING PIN ELEVATING MECHANISM

Filed May 4, 1959

3 Sheets-Sheet 3

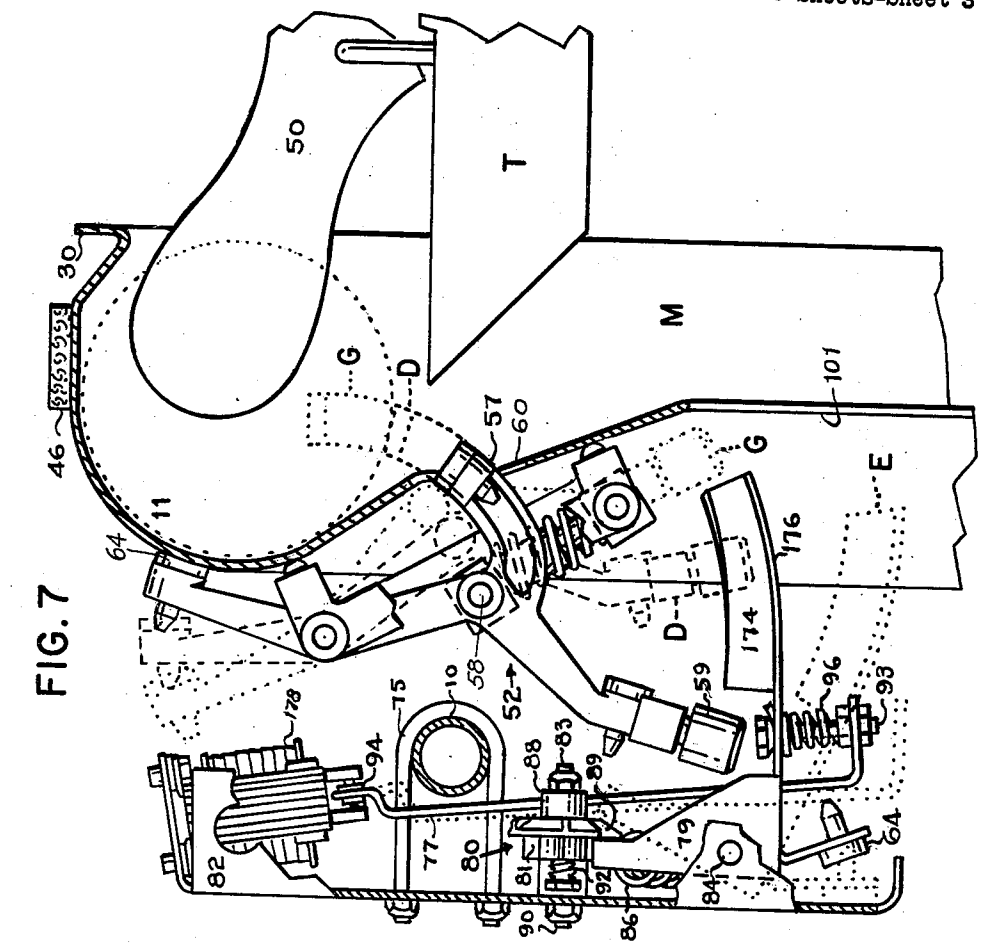

FIG. 7

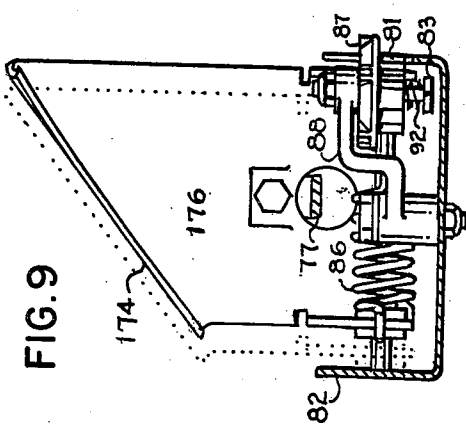

FIG. 9

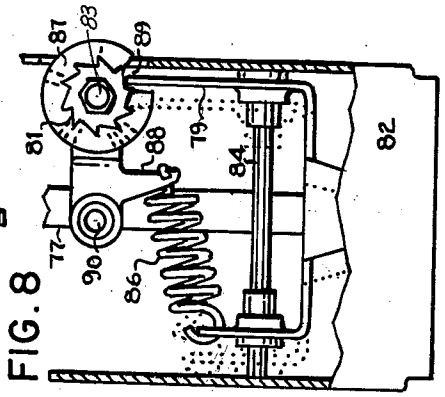

FIG. 8

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United States Patent Office 3,079,154 Patented Feb. 26, 1963

3,079,154

BOWLING PIN ELEVATING MECHANISM

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Filed May 4, 1959, Ser. No. 810,721
14 Claims. (Cl. 273—43)

This invention relates to automatic bowling pinspotting machines and more particularly to a novel annular means for conveying bowling pins from the pit of a bowling alley to a point of delivery therefrom to a pinspotting device for placement on the playing bed of a bowling alley.

The pin conveyor, constructed in accordance with the invention, is provided with a plurality of pockets, and associated with each pocket is novel pin means for retaining a bowling pin seated therein until it is released at a predetermined location or discharge station, or carried past the release station, as determined by a suitable control such as a counting mechanism. The pin holding means is so constructed and arranged that as a result of the rotary action of the wheel, each operating element thereof is travelled or moved over strategically located cams adjacent the wheel. Whereupon being actuated, each pin holding means or arm is retained in or out of engagement by a spring toggle, thus eliminating the need for coaction of the pin holding device with a continuous cam.

It is therefore an object of the present invention to provide a pin elevating member with cam actuated pin holders employing a spring toggle to retain the pin holder in a closed or open position as required to hold or release the pin seated in the pocket of which the particular pin holder is associated.

It is a further object of this invention to provide an improved mechanical means of insuring the positive release of pins when required from the pin elevating mechanism into the pin orienting and transfer device of an automatic pinspotting machine.

It is an object of this invention to provide a means of supporting a centerless pin elevating wheel by means of a circular ring longitudinally spaced from the back of the pin elevating wheel.

It is a further object of the invention to provide a novel pin elevating mechanism for a bowling pin spotting machine in the form of an annulus having a generally U-shaped cross-section and positioning elements within the walls of the U-shaped channel forming pockets seating pins for elevation from the pit of a bowling alley to a point of discharge, and wherein each pocket is provided with a selectively actuated pin holding device mounted on and traveling with the elevating mechanism for coaction with suitably positioned cams to actuate the holding devices, and wherein because of the novel construction of the holding devices, the opening in the elevating mechanism is unobstructed, thereby making it possible to remove pins from the pit of the alley and to make repairs and adjustments to the machine from the rear thereof.

It is an added object of this invention to provide means of supporting and rotating a centerless pin elevating wheel by such means as to reduce noise conductivity from said wheel to other members of the automatic pinspotting machine.

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

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

FIGURE 1 is a front elevation of a preferred form of pin elevating member embodying the invention.

FIGURE 2 is a partial view partly in section of the upper part of mechanism shown in FIGURE 1.

FIGURE 3 is a view taken approximately on line 3—3, FIGURE 1.

FIGURE 4 is a partial side view of the lower part of the mechanism shown in FIGURE 1.

FIGURE 5 is a view taken on line 5—5 in FIG. 1.

FIGURE 6 is a view taken on line 6—6, FIGURE 1.

FIGURE 6A is a view of a detail of the mechanism shown in FIGURE 6.

FIGURE 7 is a detailed view of the pin counting mechanism and pin holding device at the pin release station.

FIGURE 8 is a partial rear view of mechanism shown in FIGURE 7.

FIGURE 9 is a top view of the mechanism in FIGURE 8.

Referring to the drawings, which illustrate a preferred embodiment of the invention, the pin elevating conveyor or wheel is designated generally M. Wheel M is mounted at one side of the pit of a bowling alley, and preferably is positioned transversely thereof proximate the rear end of the pit between kickbacks K where it is operative to convey bowling pins from the pit of the alley upwardly to a point of discharge or discharge station for delivery to a pinspotter with which wheel M is associated.

While a bowling pin elevating or conveying device, constructed in accordance with the invention, is readily adaptable for use with any type of bowling pin spotting machine employing pin elevating mechanism, it is especially adaptable for use in a bowling pin spotting machine of the type shown in Holloway et al. Patent 2,767,983.

As shown in FIGURE 1, wheel M is in the form of a torous or annular ring having a center opening **101** which provides ready access to the pit of the bowling alley and to adjacent mechanism of the machine of which it forms a part for adjustment, repair, replacement and the removal and substitution of pins, when necessary.

Conveyor M is generally U-shaped in cross-section, and preferably is provided with a flat surface on its outer periphery to accommodate a driving device, such as belt **46**. The front edge **30** of conveyor M, as viewed in FIGURE 1, is formed in an angular shape such as a U-shaped or V-shaped flange facing inwardly and longitudinally with respect to the face of the wheel.

The frame designated generally **9**, for supporting conveyor M, is principally a circular ring **10** and appendaged members **12** and **14** for bridging to kickbacks K. Ring **10** is shown as tubular, but may be solid in section and the total frame may be a die stamping, casting or otherwise produced to perform its desired function. Ring **10** is attached to kickbacks K in a substantially vertical plane, spaced properly at the back or rear end of the bowling pinspotting machine of which it forms a part and is arranged at right angles to the longitudinal axis of a bowling alley.

Conveyor M is cradled in a vertical plane on guide rollers **16**. Rollers **16** are rotatably mounted on shafts **20**. These shafts are supported by members **14** and brackets **15**, the latter being attached to frame **9** (see FIGURES 1, 3 and 4). Rollers **16** are retained in operative position on shafts **20** by means of set collars **22** and cotter pins **24**.

Conveyor M is further stabilized by a belt tightener designated generally **17** which includes a guide roller **18**. This roller exerts a downward force on conveyor M as a result of the counter action of spring **28** of the belt tightening device. As shown in FIGURE 6, guide roller **18** is rotatably mounted on shaft **32** in spaced support arms **34** of H-lever **35** pivoted on member **36** on ring **10**. Guide rollers **16** and **18** are each formed with a grooved flange

26, which engages flange 30 at the outer edge of conveyor M for preventing axial movement of conveyor M.

Belt tightening roller 38 of belt tightener 17 extends in the opposite direction from roller 18 and is rotatably mounted in support arm 40 on shaft 42 supported in spaced arms 41 of H-arm 40. Coil spring 28 is located above pivot member 36 between upright flange 42 of H-support arm 40, and flange of adjusting screw 44 fixed to upright flange 43 of support 34. Thus spring 28 exerts a force on pivoting support arm 34 driving guide roller 18 in a downward direction against conveyor M, and an opposing force on support arm 40 forcing flanged belt tightening roller 38 in a downward direction against belt 46.

Drive belt 46 circumscribes conveyor M along the flat surface of its outer periphery and is driven by a suitable power source (not shown) through sheave 48 in direction A, FIGURE 1. Drive belt 46 passes between conveyor M and guide rollers 16 and 18, thus decreasing sound transmission from conveyor M to other members of the mechanism.

Pins 50 delivered to station S1 by suitable conveying means including roller 15, move into pockets 11 of elevating wheel M. The means for delivering pins into and seating them in pockets 11 and pockets 11 may be similar to that shown in Holloway et al. Patent 2,767,983, and further detailed description and illustration are omitted in the interest of brevity. Pins 50 seated in elevating wheel M are carried upwardly, either butt end first or handle end first in pocket 11 in the direction of arrow B in FIGURE 1 to pin discharge station S2.

At station S2, pins 50 when released, as described hereinbelow, gravitate out of pockets of conveyor M onto pin aligning and transfer mechanism T as conveyor M travels each pocket in succession therepast. Pin aligning and transfer mechanism T may be similar in construction and operation to that shown in Zuercher Patent 2,767,984, for Pin distributing and spotting Mechanism for bowling pin spotting machines, and only so much as is required for a proper understanding of the present invention is included herein.

Referring to FIGURE 1, pin discharge station S2 is shown substantially directly over station S1. If desired, station S2 may be located at some other position along the path of travel of conveyor M as long as space is provided for the release of pins 50 from conveyor M into pin aligning and transfer device T.

As pin elevating wheel M with pins 50 seated in its pockets rotates from pickup station S1 toward station S2, gravity tends to dislodge pins 50 from their seated positions. To prevent this, a pin gripping device 52 is provided for each pocket in order to hold each pin 50 in its respective pocket against removal therefrom as it is conveyed toward discharge station S2.

Pin elevating wheel M, as shown, normally has seven equidistantly spaced pockets, and seven pin gripping devices 52 are required, one for each pocket. The construction and operation of each device 52 is the same. Therefore, in the interests of brevity, only one is described in detail.

Referring to FIGURES 5, 5*a* and 7, each pin holding device 52 includes a mounting bracket 54, a pin clamping arm 56 having a rotatably mounted cam follower 59 and a toggle joint 66. Pin clamping arm 56 is pivotally attached to bracket 54 by pin 58. Bracket 54 is mounted on the rear of elevating wheel M disposed radially relative thereto and in such a way as to allow member 57 of clamping arm 56 to move through an elongated opening 60 in conveyor M. Swivel block 68 is pivotally attached to pin clamping arm 56 by pin 70 and has fixed thereto a tubular extension or sleeve 71. Swivel block 72 is pivotally attached to bracket 54 by pin 74 and has a rod 73 fixed thereto which slides freely in tubular extension 71.

A coil spring 76 surrounds tubular extension 71 and rod 73 and bears against swivel blocks 68 and 72, so that the expansion force of coil spring 76 retains pin clamping arm 56 in open or closed position when the pin clamping arm is moved beyond the center of pivotal alignment.

Shock mounts 64 mounted in the free ends of levers 56 are provided for each device 52 in order to absorb shock and noise. In its travel outwardly, pin clamping arm 56 is stopped in position C, by contact with conveyor M, while bracket 54 serves as the stop for the fully closed position G. Shock mounts 64 are used at these points as well as at the end of member 57 of clamping arm 56 to cushion contact with bowling pins 50. Shock mounts 62 are used between bracket 54 and conveyor M.

In the operation of the associated machine, rotary pin conveyor M is rotated through pit P of the alley with which it is associated in direction B, FIGURE 1. Pins 50 delivered to station S1 by pit conveyor 51 running on roller 53 become seated in pockets of conveyor M for delivery to discharge station S2. Clamping devices 52 on conveyor M are normally in open position as conveyor M passes station S1. In this position, shown in C, FIGURE 5, member 57 of clamping arm 56 has been withdrawn through opening 60 out of its associated pocket, thereby furnishing an unobstructed path for any pin 50 entering a pocket.

As conveyor M is rotated elevating a pin 50 from station S1 to station S2, the clamping arm roller 59 contacts inclined cam 78, FIGURE 5. Cam 78 is shown as a welded unit, but may be a light casting or otherwise produced to perform its desired function. Cam 78 is mounted on frame 10 by U bolt 80 generally midway between station S1 and S2. Roller 59 travels along the lower face of cam 78, as viewed in FIGURE 6. As roller 59 travels upwardly along cam 78, it pivots arm 56 against the action of spring 76. The movement of arm 56 radially on pivot pin 58 moves toggle 66 radially on pin 74. When cam 78 has carried arm 56 beyond pivotal alignment with toggle 66, the expansive force of spring 76 drives member 57 of arm 56 into clamping position D against pin 50, preventing the removal of pin 50 from pocket 11.

In the event conveyor M has failed to receive a pin 50 at S1, and upon passing over cam 78, pin clamping arm 56 will toggle to fully closed position G, FIGURE 5. It will be obvious from FIGURE 6 that pin clamping arm 56 will also hold pins of smaller diameter, as with turned down or refinished pins.

At station S2, FIGURE 1 and FIGURE 2, a selectively operable relase mechanism is provided to release pins 50 from their respective pockets 11 when such pins are required during the cycle of operation of the associated bowling pinspotting machine. In the illustrated embodiment of the invention, FIGURE 2, the release mechanism enclosure 82 is mounted on ring 10 by U bolts 75 at the rear of conveyor M. As shown in FIGURE 7, the release mechanism preferably includes a pin counting plate 176, associated solenoid 78 and mechanical counter 80.

Pin counting plate 176 is so formed that when mounted pivotally on horizontal shaft 84 in enclosure 82, its outer extremity or cam 174 is capable of arcuate swing in a vertical plane into and out of the path of travel of cam followers 59 of pin holding devices 52. The inner flange 79 of pin counting plate 176 extends upwardly to engage counting mechanism 80, and as hereinunder described, serves as the reciprocating pawl to turn ratchet wheel 81. Pin counting plate 176 is normally in down position E as shown in broken lines in FIGURE 7, at which position it is disengaged from counting mechanism 80 and out of the path of cam follower 59.

As conveyor M rotates to deliver pins 50 in pockets 11 to pin release station S2, cam follower 59 of each pin clamping device 52 engages cam 174 of pin counting plate 176, as shown at D, FIGURE 7. The engagement of cam follower 59 with cam 174 moves pin counting

plate 176 generally horizontally on shaft 84 against the counter force of coil spring 86, causing member 79 to move ratchet wheel 81 (FIGURE 8) one step.

The continuing rotation of conveyor M moves each cam follower 59 in succession outwardly along cam 174 until each toggle 66 actuates to force its respective holding device 52 to full open position. This action retracts arm 56 through opening 60 and out of pin engaging position in pocket 11. When thus released, pin 50 gravitates into pin aligning and transfer device T. Transfer device T may be similar in construction and operation to that shown in Zuercher Patent 2,767,984. Since it forms no specific part of the invention, further disclosure thereof is omitted.

When continued rotation of wheel M effects the disengagement of cam follower 59 from cam 174, counting plate 176 is returned to original position by coil spring 86 which is connected at one end to the upright shoulder flange of counting plate 176 opposing flange 79. The other end of spring 86 is connected to bracket 88 of counting device 80. Bracket 88 is pivotally mounted on housing 82 by shoulder screw 90. Thus spring 86 maintains in counting device 80 a downward pressure against reciprocating flange 79 of counting plate 176.

Ratchet wheel 81 is rotatably supported on shoulder screw 83 mounted in bracket 88. Reverse motion of ratchet wheel 81 is prevented by coil spring 92 which surrounds shoulder screw 83 between head of screw 83 and ratchet wheel 81 (FIGURE 9).

Ratchet wheel 81 is provided with ten teeth and an integral flange 87 projecting beyond and around the outer periphery thereof. A segment 89 of flange 87 is removed at one tooth of ratchet wheel 81 to provide an opening for passage of member 79 of counting plate 176 in and out of engagement with ratchet wheel 81.

It will be apparent from the foregoing that when during the cycle of operations of the associated pin spotting machine, pins are required by the pinspotting mechanism (not shown), cam 174 is positioned in the path of travel of cam followers 57 in order to break the toggle 66 of each of the gripping devices 52 and thereby effect the release of pins at station S2. In order to assure the positioning of cam 174 in its operative position, shown in full lines in FIGURE 7, when pins are to be fed to the pinspotting mechanism, there is provided a suitable circuit (not shown) which includes actual actuating means, such as a manual control solenoid 178 to energize it and thereby move cam 174 from position E to that shown in full lines in FIGURE 7. This circuit is maintained until at least one pin of the desired number of pins has been fed to the pinspotting mechanism. As shown herein, ten pins are delivered in succession to aligning and transfer device T, since ratchet wheel 81 has ten teeth. After the first pin of a set of pins has been fed, pawl 79 is maintained in engagement with the teeth of the ratchet wheel despite the fact that the circuit can be broken, and it is not until ten pins have been fed and the ratchet wheel engaged end of pawl 79 moves into cut out segment 89 in flange 87 that armature 77 is allowed to drop down, and return cam 174 to its inoperative position E.

When ten pins have been delivered to the associated pinspotting mechanism, ratchet wheel 81 and its flange 87 has made a complete revolution, thus returning cut out segment 89 to its original position and allowing counting plate 176 to pivot by force of gravity to position E (FIGURE 7) and out of the path of travel of cam followers 59. Counting plate 176 will thus remain inactive until erected by energized solenoid 178.

Armature 77, which links solenoid 178 to counting plate 176, is centered in the solenoid plunger by suitable spacers 94 which permit the required swing of armature 77. Armature 77 extends through an opening in counting plate 176 and is connected resiliently thereto by shoulder screw 93 which depends freely from counting plate 176 (FIGURE 7). Coil spring 96 encircles screw 93 between the free end of armature 77 and counting plate 176.

The connection of the free end of armature 77 to counting plate 176 is such that if cam 174 of counting plate 176 should strike a cam follower 59 while being moved by solenoid 78 into operating position, armature 77 will compress spring 94 and allow solenoid 78 to complete retraction. When cam follower 59 has moved on, counting plate 176 will rise to its operating position as a result of the expansion of spring 96.

Means are provided for indicating the number of pins delivered to the pinspotting mechanism. As shown in FIGURE 8, flange 87 extends through opening in release mechanism housing 82 so that markings on flange 87 may be clearly visible. These markings may be numbers, detents or projections formed integrally with flange 87. Thus a visible indication is given so that the number of pins 50 delivered to the pinspotting mechanism at any time during its cycle operation can readily be determined.

All pin holding devices 52 arriving at release station S2 are in closed position whether or not the associated pocket 11 of conveyor M carries a pin 50, as described hereinabove. A pocket 11 of conveyor M arriving at release station S2 without a pin 50 will have its associated pin holding device 52 in closed position. Each cam follower 59 in such case will pass cam 74 at position G, or out of engagement with counting plate 176, FIGURE 7, and therefore cannot operate the counter 80.

Occasionally pocket 11 will be moved to and past release station S2 without pins seated therein. Also if more than ten pins are being handled in the machine, the demands of the pin spotting mechanism may be such that pins held in pockets 11 may not be released at station S2. Whenever this occurs, it is necessary to effect the movement of pin clamping arms to their inoperative positions before wheel M moves their respective pockets 11 to receiving station S1. In order to so move arms 56, there is provided a cam 98 so positioned with respect to came followers 59 that each cam follower on an arm 56 in pin holding position will engage came 98 and break toggle 66, thereby effecting the movement of such arms 56 to inoperative position. As shown in FIGURE 3, cam 98 is attached to ring 10 by U-bolt 80 at a point to the right and above station S1, as viewed in FIGURE 1. Cam 98 is so positioned that when arms 56 are moved out of holding engagement with pins in pockets 11, gravity will not cause pins seated in pockets 11 to fall out or be dislodged therefrom.

To prevent pins 50 bouncing out of pit P through conveyor M opening 101, a pin bounce board 100 of suitable size and shape, is provided in the lower part of the opening 101, as shown in FIGURE 1. Spring clamps 102 fastened to pin bounce board 100 clamp over circular frame 10. Pin bounce board 100 is therefore easily removed for pin changing or repair work through conveyor M opening 101.

Thus the invention provides a novel and efficient mechanism for handling bowling pins and delivering them from the pit of a bowling alley to an elevated discharge station whence they are conveyed to apparatus for spotting them on a bowling alley.

What I claim is:

1. In a bowling pin elevating mechanism, the combination of:

a rotary annular channel member provided with a plurality of pockets for receiving bowling pins during elevation of such pins from a pin receiving station to a pin discharge station;

means for maintaining the pins in said pockets during elevation of the pins;

a driven belt encircling said channel member and engaged with the outer periphery thereof for rotating said channel member;

a pair of support rollers disposed on opposite lower

sides of said rotary channel member and engaging said belt so that said channel member is supported for rotation on said rollers via said belt;

and means to prevent axial movement of said channel member.

2. A bowling pin elevating mechanism in accordance with claim 1 wherein

said last-mentioned means comprises

an outwardly extending annular flange on said channel member,

and shoulder means on said support rollers abutting opposite sides of said flange.

3. A bowling pin elevating mechanism in accordance with claim 1 and including

means for maintaining a predetermined tension on said belt, which means comprises

a third roller disposed above said channel member and engaged with said belt for holding adjacent portions thereof in engagement with adjacent portions of the outer periphery of said channel member,

a tensioning roller engaged with said belt,

and means biasing said third roller and said tensioning roller into engagement with said belt.

4. In a bowling pin elevating mechanism, the combination of:

a rotary conveyor having a plurality of pockets each adapted to receive a bowling pin;

toggle operated pin holding mechanism for holding pins seated in said pockets during elevation of such pins, said mechanism comprising

a plurality of pin clamping members each pivotally mounted on said conveyor in association with one of said pockets, each of said clamping members being movable between an open position and a pin holding position;

a plurality of cam followers each carried by a different one of said clamping members for moving said clamping members from said positions,

and a plurality of toggle devices each associated with one of said clamping members for moving said clamping members into said positions;

a pin counting mechanism;

a first cam engageable with said cam followers for moving said clamping members from said open positions into said pin holding positions;

a second cam for actuating both said pin counting mechanism and said cam followers to effect the discharge of elevated pins,

said second cam being engageable with each of said cam followers for first operating said counting mechanism while a pin is held by the one of said clamping members associated with the one of said cam followers engaged with said second cam and then actuating said cam follower and said toggle device associated therewith to discharge such pin.

5. In a bowling pin elevating mechanism, the combination of:

a rotary conveyor having an annular channel member provided with a plurality of evenly spaced pockets each adapted to receive a bowling pin at a pin receiving station and elevate such pin toward a pin discharge station;

a plurality of movable clamping members mounted on said channel member each in association with one of said pockets, each of said clamping members being movable between an open position allowing reception of a pin at said receiving station and discharge of such pin at said discharge station and a pin holding position adapted to hold a pin seated in the one of said pockets associated therewith;

a plurality of cam followers each carried by a different one of said clamping members;

a plurality of toggle means each associated with one of said clamping members and operative upon actuation of the one of said cam followers associated therewith to move said clamping member associated therewith from one of said positions to the other of said positions;

a cam for actuating said cam followers whereby said clamping members are moved into said pin holding positions;

a pin counting mechanism;

a pin counting plate mounted adjacent to said discharge station for movement between a plurality of positions,

said pin counting plate including

an actuating portion engaged with said pin counting mechanism for actuating said mechanism in response to movement of said plate between certain of said positions,

and a cam portion engageable with each of said cam followers when said clamping member associated therewith is in said pin holding position whereby rotation of said channel member first causes said cam followers to move said counting plate between said certain positions to actuate said counting mechanism and then causes said counting plate to actuate said cam followers and thereby discharge the pins.

6. A bowling pin elevating mechanism in accordance with claim 5 wherein

said pin counting mechanism includes a ratchet wheel,

and said actuating portion of said counting plate comprises a driving pawl engageable with said ratchet wheel.

7. A bowling pin elevating mechanism in accordance with claim 5 and including

a stationary shaft,

said counting plate being mounted on said shaft so that the movement of said counting plate between said certain positions comprises movement axially along said shaft.

8. A bowling pin elevating mechanism in accordance with claim 5 wherein

each of said toggle means comprises

a first swivel member connected to the one of said clamping members associated therewith,

a second swivel member operatively mounted on said channel member,

a sleeve extending from one of said swivel members toward the other of said swivel members,

a rod extending from said other swivel member toward said one swivel member and slidably engaged with said sleeve,

and a compression spring encircling said rod and said sleeve and biasing said swivel members apart.

9. In a bowling pin elevating mechanism, the combination of:

a rotary conveyor having an annular channel member provided with a plurality of evenly spaced pockets each adapted to receive a bowling pin at a pin receiving station and elevate such pin toward a pin discharge station;

a plurality of clamping members mounted on said channel member each in association with one of said pockets, each of said clamping members being movable between an open position allowing reception of a pin at said pin receiving station and discharge of such pin at said pin discharge station and a pin holding position adapted to hold a pin seated in said pocket associated therewith;

a plurality of cam followers each carried by a different one of said clamping members;

a plurality of toggle means each associated with one of said clamping members and operative upon actuation of said associated cam follower to move said associ-

ated clamping member from one of said positions to the other of said positions;

a cam for actuating said cam followers to move said clamping members into said pin holding positions;

a pin counting mechanism;

a pin counting plate mounted adjacent to said discharge station for movement between first, second and third positions,

said pin counting plate comprising

an actuating portion engageable with said pin counting mechanism for actuating said pin counting mechanism upon movement of said counting plate from said first position to said second position,

and a cam portion engageable with each of said cam followers when each of said associated clamping members is in said pin holding position whereby rotation of said conveyor causes such cam follower to move said plate from said first position to said second position,

said cam portion being operative when in said second position to actuate the one of said cam followers engaged therewith to effect discharge of a pin into said discharge station;

means biasing said plate from said second position to said first position whereby after actuation of each cam follower said plate is moved from said second position to said first position;

means biasing said plate from said first position to said third position wherein said cam portion is out of the path of travel of said cam followers;

selectively operable means for moving said plate from said third position to said first position;

and means for holding said plate in said first position after operation of said selectively operable means until said pin counting mechanism has counted a predetermined number of pins.

10. A bowling pin elevating mechanism in accordance with claim 9 wherein said selectively operable means comprises an electromagnet.

11. A bowling pin elevating mechanism in accordance with claim 9 wherein

said pin counting mechanism comprises a ratchet wheel, said holding means for said plate comprises a flange integral with said ratchet wheel,

and said actuating portion comprises a driving pawl engageable with said ratchet wheel and said flange.

12. A bowling pin elevating mechanism in accordance with claim 11 wherein said flange has a recess for receiving said pawl when said plate is in said third position.

13. A bowling pin elevating mechanism in accordance with claim 9 including

a cam located between said discharge station and said receiving station for actuating said cam followers so that all of said clamping members are moved to said open positions before entering said pin receiving station.

14. In a bowling pin elevating mechanism, the combination of:

a rotary conveyor having

an annular channel member provided with a plurality of evenly spaced pockets for receiving bowling pins during elevation of such pins from a pin receiving station to a pin discharge station,

and a central aperture;

means for maintaining the pins in said pockets during elevation of such pins, said means comprising

a plurality of toggle operated pin holding means, and means for actuating said last-mentioned means;

a driven belt encircling said channel member and engaged with the outer periphery thereof for rotating said channel member;

a pair of support rollers disposed on opposite lower sides of said rotary channel member and engaging said belt so that said channel member is supported for rotation on said rollers via said belt;

and means to prevent axial movement of said channel member.

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