July 28, 1964 A. B. VIESCAS 3,142,486

ROTARY TYPE PIN ELEVATOR WITH SELECTIVELY OPERATED GRIPPER CONTROL ADJACENT THE RECEIVING STATION

Filed Sept. 11, 1961 2 Sheets-Sheet 1

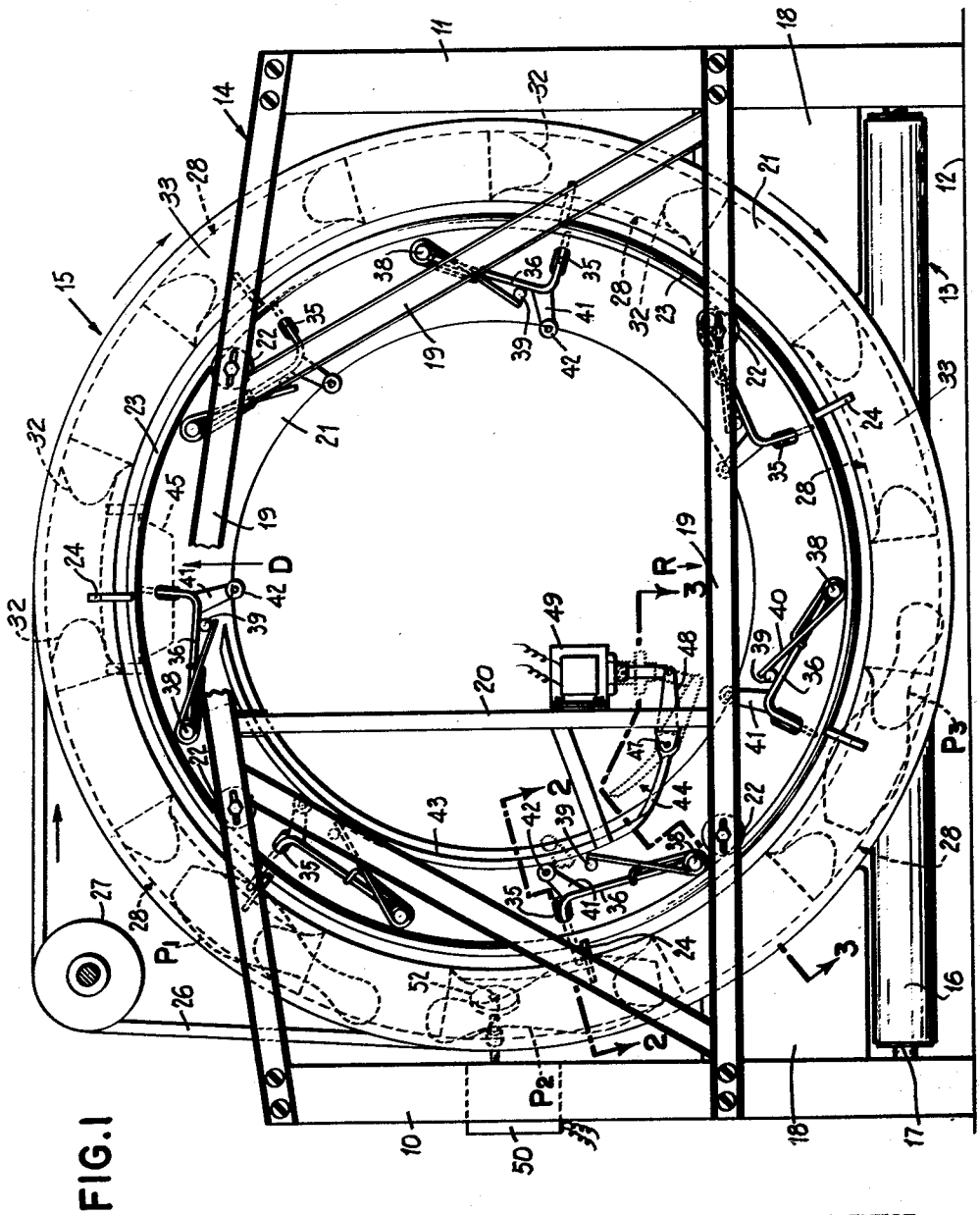

FIG. 1

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FIG. 2

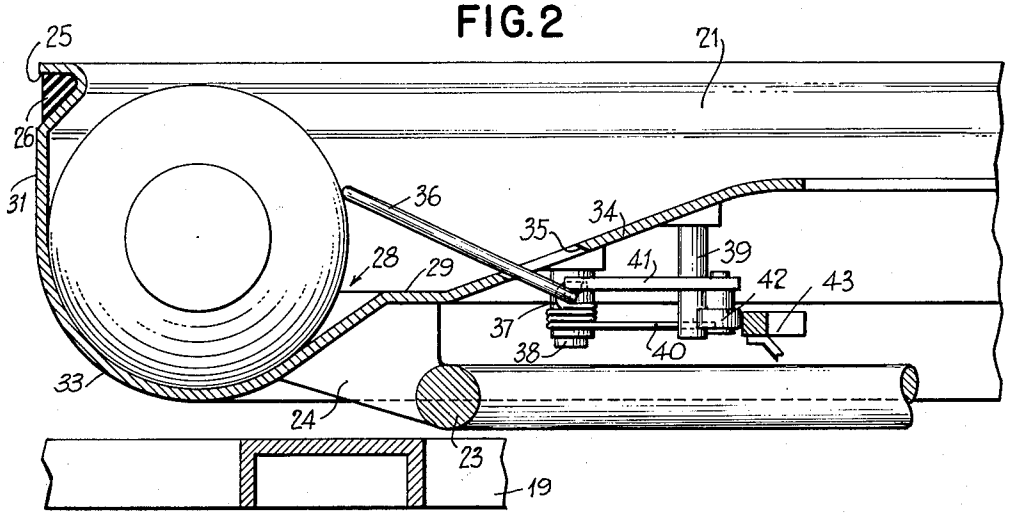


FIG. 3

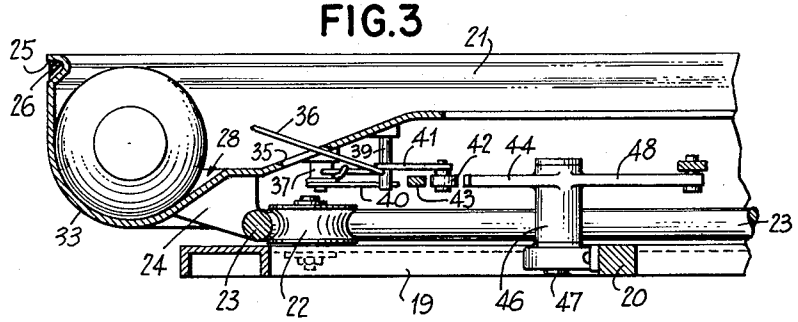
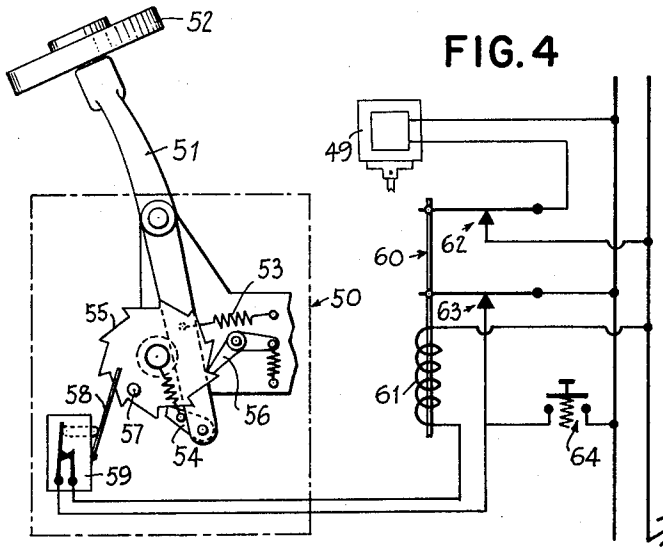


FIG. 4



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ROTARY TYPE PIN ELEVATOR WITH SELECTIVELY OPERATED GRIPPER CONTROL ADJACENT THE RECEIVING STATION

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This invention relates to bowling pin elevating mechanisms particularly adapted for use in automatic bowling pin setting machines for lifting bowling pins which have been knocked, swept or dumped into the pit of a bowling alley installation and discharging such pins at a point spaced above the bottom of the pit for eventual transfer back into playing position upon the alley bed.

One of the objects of the invention is to provide novel bowling pin elevating apparatus for use in a bowling pin spotting machine.

Another object is to provide bowling pin elevating apparatus for lifting pins which have fallen into the pit of a bowling alley installation to a discharge point spaced above the bottom of the pit.

Still another object is to provide a bowling pin elevating mechanism which is cyclically operable to elevate a predetermined number of pins during each cycle of operation.

A further object is to provide a bowling pin elevating mechanism with means which is selectively operable to either elevate bowling pins to an elevated point or to preclude the pins from being elevated to the elevated point.

In order that the manner in which these and other objects are attained in accordance with the invention can be understood in detail, reference is had to the accompanying drawings, which form a part of this specification, and wherein:

FIGURE 1 is a rear elevational view, with a portion of the frame removed, illustrating one embodiment of the invention;

FIGURE 2 is a radial cross-sectional view taken along lines 2—2 of FIGURE 1, FIGURE 2 being on an enlarged scale relative to that of FIGURE 1 for clarity;

FIGURE 3 is a radial cross-sectional view taken generally along line 3—3 of FIGURE 1 but illustrating the cam gate in an open position and illustrating the rotary elevating mechanism in a position where the reference line passes through a pocket; and

FIGURE 4 is a schematic diagram illustrating the pin counter and the control system.

Referring now to the drawings, there is shown in FIGURE 1 a portion of a bowling pin spotting machine mounted at the pit end of a bowling alley installation having a pair of parallel kickbacks **10** and **11** which extend along the sides and upwardly from the floor **12** of the pit, in the usual fashion. The bowling pin spotting machine includes a conveyor **13**, a frame **14** and a bowling pin elevating mechanism **15** operative to lift bowling pins from a pin receiving station R to a pin discharge station D vertically spaced above the pin receiving station. The bowling pin elevating mechanism **15** is designed to be used in bowling pin spotting machines of the type in which pin elevating apparatus of the type disclosed in Patent 2,767,983, Holloway et al., can be used.

Conveyor **13** includes a continuously-driven, endless belt **16** which passes over a pulley **17** that extends transversely of the pit above floor **12**. A pair of plows **18** are mounted on kickbacks **10** and **11** and are operative to direct pins from the sides toward the center of the belt and into the pin receiving station. Thus, any pins

which fall into the pit come to rest on belt **16** and are carried thereby into the pin receiving station R.

Frame **14** comprises a plurality of channel sections **19** rigidly affixed to the rear ends of kickbacks **10** and **11** and a vertical bar **20** secured between two of the channel members, in the manner illustrated in FIGURE 1.

Bowling pin elevating mechanism **15** includes a rotary annular channel member **21** supported for rotation about a horizontal axis by four rollers **22** each mounted on frame **14**. Rollers **22** engage an annular track **23** secured to the rear of channel member **21** by a plurality of lugs **24**. Channel member **21** is constructed of sheet metal and has a peripheral, outwardly facing groove **25** adapted to receive a belt **26** which is driven by a pulley **27** so that the annular channel member is continuously rotated in a clockwise direction as viewed in FIGURE 1, the pulley being continuously driven by means such as an electric motor (not shown).

Channel member **21** has a plurality of pin receiving and holding pockets **28** evenly spaced about the inner periphery thereof and includes a flat portion **29** which lies in a plane that extends transversely of the axis of the channel member, and a lip **31** which contains groove **25**. Each of the pockets includes inclined end walls **32** each located on a different end of a curved portion **33** having approximately the same radius of curvature as the maximum outer diameter of a bowling pin. Lip **31** is curved and is slightly conical so that a properly aligned pin can roll over the lip to become fully seated in the pocket. Alternatively, the channel member and pockets can be formed as disclosed in the above-mentioned Patent 2,767,983.

As channel member **21** rotates and pins are delivered thereto at receiving station R, the pockets **28** are operative to receive and elevate only those pins which have their longitudinal axes lying lengthwise within pockets **28** and in a plane transverse to the axis of rotation so that the pins are carried either butt-end first or head-end first in the direction of rotation, as shown in FIGURE 1. When there are a number of pins in receiving station R, the combined movements of the conveyor, of the channel member **21** and of the pins themselves tumbles the pins so that each pocket might not receive a pin each time it passes through the receiving station; however, the combined movements tend to properly position the pins so that, eventually, all of the desired number of pins can be picked up for elevation to the discharge station.

Channel member **21** also includes a conical portion **34** (FIGURE 2) having a plurality of evenly spaced oval shaped slots **35**, each slot being in alignment with one of pockets **28**. Through each of slots **35** extends one end of a movable pin retaining rod **36** having its other end bent and mounted on a collar **37** rotatably supported on a stud **38** for rotation about an axis parallel to the axis of rotation of channel member **21**. Each stud **38** is mounted on conical portion **34** spaced from but adjacent to its associated slot. A stud **39** is also mounted adjacent to each slot **35** and each stud **38** and anchors one end of a torsion spring **40** having its other end engaged with the associated retaining rod **36**, the torsion spring surrounding a portion of collar **37**. The torsion springs bias the retaining rods toward engagement with studs **39** which form stop members for limiting movement of the retaining rods away from engagement with the pins carried by the pockets.

Secured to each of retaining rods **36** is a cam follower **41** which extends inwardly from its associated retaining rod and has a roller **42** engageable, in a manner described hereafter, with an arcuate, stationary cam track **43** mounted on bar **20**. Cam track **43** is a rod of rectan-

gular cross section and extends along a circular arc of greater diameter than the diameter of the path of travel of rollers **42** which path occurs when the retaining rods are biased into engagement with studs **39**.

A cam gate **44** is pivotally mounted on bar **20** for movement between a closed position engaged with the leading end of cam track **43** and constituting a forward extension thereof and an open position, indicated by the dotted lines in FIGURE 1, spaced inwardly from the leading end of cam track **43** a distance sufficiently great to allow the rollers to pass therebetween. Cam gate **44** is integral with a collar **46** pivotally mounted on a stud **47** and with a lever **48** pivotally connected to the plunger of a solenoid **49** so that the cam gate is moved between its open and closed positions in response to actuation of the solenoid. When the solenoid is energized, the cam gate is closed and when the solenoid is deenergized, the cam gate is open.

The cam track and the cam gate are positioned in the plane of rotation of rollers **42**. When the cam gate is open, the rollers pass to the rear of the cam track and in front of but spaced from the cam gate. When the cam gate is closed, it extends across the path of travel of the rollers and is operative to engage the rollers as they pass by causing the rollers to roll onto the outer surface of cam track **43**, the cam track then being effective to hold the pin retaining rods in their pin retaining positions until the pins are delivered to the pin discharge station. As the rollers roll onto the cam track, the retaining rods are moved against the bias of springs **40** from their normally inoperative position, illustrated in FIGURE 3, into their operative or pin retaining position illustrated in FIGURE 2. In its pin retaining position, each retaining rod is engageable with the outer medial surface of a bowling pin positioned with the pocket associated therewith, the retaining rod being effective to hold the bowling pin against the rear wall of the cup to prevent the bowling pin from moving either inwardly from or along the pocket and thereby prevent the pin from being removed or falling from the cup. In its inoperative or pin release or discharge position, each retaining rod, although it extends partly into the pocket associated therewith, is inoperative to prevent a pin from falling out of or being removed from the pocket.

As each pocket **28** picks up a bowling pin in receiving station R and carries such pin along a circular path toward the pin discharge station, a point is reached in the path of travel where the bowling pin, in the absence of any retaining force, will fall out of the pocket and backwardly into the pin receiving station. That is, the pockets are operative by themselves to only partially elevate the bowling pins from the receiving station toward the discharge station. Cam gate **44** and cam track **43** are positioned so that, when the cam gate is closed, the pin retaining rods are moved into their pin retaining positions prior to the time at which the pins would fall out of the pockets. That is, cam track **43** is positioned adjacent to that portion of the path of travel of a bowling pin as it moves from the pin receiving station to the pin discharge station during which a pin tends to fall out of a pocket.

Cam track **43** terminates adjacent to the pin discharge station D so that, as each pocket moves into the discharge station, the roller **42** associated with that pocket rolls off the cam track and moves inwardly, under the bias of spring **40**. As such movement occurs, the pin retaining rod moves from its pin retaining position and releases the pin engaged thereby so that the pin falls onto the pan **45** of a distributor of the type disclosed in U.S. Patent 2,767,984, Zuercher.

A pin counter **50** is mounted on kickback **10** and is operative to count only those pins which are elevated and discharged into the discharge station. The pin counter includes a lever **51** pivoted at a point intermediate to its ends and carrying on one end a circular head **52** biased by a spring **53** into the path of movement of bowling pins held in the pockets of channel member **21**. The head is positioned at a point along the path of travel at which point a bowling pin cannot reach unless the pin is held in a pocket by a retaining rod. That is, in the absence of any retaining force, a bowling pin will fall out of a pocket prior to reaching the head **52**.

The other end of lever **51** carries a driving pawl **54** biased by spring **53** into engagement with a ratchet wheel **55**. The ratchet wheel is also engaged by a detent pawl **56**. As each bowling pin passes by pin counter **50**, the bowling pin engages head **52** and pivots lever **51** causing driving pawl **54** to rotate ratchet wheel **55** through an angular displacement corresponding to the spacing of the teeth of the ratchet wheel.

Ratchet wheel **55** carries a projection **57** engageable with the actuating lever **58** of a single-pole, single-throw, normally-closed switch **59**. Projection **57** actuates lever **58** to momentarily open switch **59** once for each revolution of ratchet wheel **55**. Since, in the arrangement illustrated, there are ten teeth on the ratchet wheel, it is obvious that switch **59** will be opened once for every group of ten bowling pins counted by pin counter **50**.

Actuation of solenoid **49** is controlled by a relay **60** comprising an electromagnet **61** and a pair of single-pole, single-throw, normally-open switches **62** and **63**. Switch **62** is connected to solenoid **49** so that, when switch **62** is closed, solenoid **49** is energized. A normally open push button switch **64** is connected in parallel with switch **63** and the resultant parallel combination of switches **63** and **64** is connected in series with switch **59** and with electromagnet **61**.

Operation

The present invention is designed to perform a cycle of elevating only ten bowling pins into the discharge station upon each cycle of operation. Prior to commencement of a cycle, relay **60** is deenergized so that solenoid **49** is also deenergized and cam gate **44** is open, push button switch **64** is open, switch **59** is closed, and projection **57** is located at that position which it occupies immediately after having opened switch **59** in the previous cycle. As has been previously indicated, channel member **21** is continuously driven but, since the cam gate is open, any pins picked up by the pockets at the receiving station fall out of the pockets and are not elevated into the discharge station.

To begin a cycle, push button switch **64** is momentarily closed to energize relay **60** and close switches **62** and **63**. When switch **63** closes, it establishes a holding circuit for energization of electromagnet **61** and allows the push button switch to be released. The closing of switch **62** energizes solenoid **49** and closes cam gate **44** so that the bowling pins picked up in pockets **28** are elevated and discharged into discharge station D, such pins being counted by pin counter **50**.

With reference to FIGURE 1, let us assume that eight pins have already been delivered to the discharge station, P1 is the ninth pin, P2 is the tenth pin, and P3 represents the eleventh and all succeeding pins. Pin P1 has just passed pin counter **50** causing the ratchet wheel to assume the position shown in FIGURE 4. As the tenth pin P2 passes by pin counter **50**, switch **59** is momentarily opened to cause de-energization of relay **60**. When this happens, solenoid **49** is de-energized and cam gate **44** is moved to its open position so that the cam follower associated with the pocket carrying pin P3 will not engage the cam gate and pin P3 will thereupon fall out of the pocket. Thus, after the cam gate opens, the elevating mechanism is incapacitated to elevate any more pins until another cycle is performed.

Whereas only a single embodiment has been disclosed, it will be apparaent that many changes can be made in the details of construction and in the arrangement of parts without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. In a bowling pin elevating mechanism, the combination of a continuously driven rotary conveyor operable to carry pins along an accurate path of travel from a pin receiving station to a pin discharge station spaced above said pin receiving station, said path including a portion in which pins carried by said conveyor are gravity biased away from said conveyor; retaining means movable between a first position operable to retain pins on said conveyor and a second position wherein the pins can fall from said conveyor; means for moving said retaining means between said positions, the last-mentioned means including cam means to move said retaining means into said first position, means to hold said retaining means in said first position to elevate pins and means to effect movement to said second position on arrival at said discharge station; and control means selectively operable to render said cam means inoperative to move said retaining means into said first position throughout movement thereof from said receiving station to said discharge station.

2. In a bowling pin elevating mechanism, the combination of continuously driven conveying means including a rotary conveyor having at least one pocket operable to receive a bowling pin at a lower pin receiving station and to carry such pin along an arcuate path of travel toward an upper discharge station, said path of travel including a substantial portion in which the pin in the absence of any retaining force can fall from said pocket, and at least one retaining member associated with said pocket, said retaining member being movable between a first position operable to retain a pin in said pocket and a second position operable to allow a pin to fall from said pocket; a cam follower operatively connected to said retaining member for movement therewith; a cam gate at the location of said receiving station movable between a first position, operative to engage said cam follower and move said retaining member from said second position toward said first position, and a second position wherein said cam gate is inoperative to move the retaining member to said first position, and a cam track engageable with said cam follower and extending from said cam gate to said discharge station for maintaining said retaining member in said first position when the same is moved thereto by means of said gate, the termination of said track at said discharge station effecting release of said retaining member from its said first position to allow falling of a pin from said pocket.

3. Bowling pin elevating mechanism for elevating bowling pins from a pin receiving station to a pin discharge station spaced above said pin receiving station, comprising a rotary conveyor having a plurality of pockets each adapted to receive a bowling pin at said pin receiving station and carry such pin along an arcuate path including a portion in which such pin can fall out of said pocket and back into said pin receiving station, a plurality of pin retaining members each mounted on said conveyor adjacent to one of said pockets and movable between a pin retaining position operative to retain a pin in said pocket associated therewith and a second position inoperative to retain a pin in said pocket, means biasing said retaining members toward said inoperative positions, an arcuate stationary cam track concentric to said portion of said path of travel, a movable cam gate at the lower, receiving station end of said cam track movable between a closed position aligned with said cam track and an open position not aligned with said cam track, a plurality of cam followers each connected to one of said pin retaining members for movement therewith, said cam gate when in said closed position extending across the normal path of travel of said cam followers and being operative to move said pin retaining members into said pin retaining positions following the reception of pins by their associated pockets thereby to elevate pins to said discharge station, said cam track terminating at said discharge station to effect the discharge of all retained pins into said discharge station, said cam gate when in said open position being inoperative to engage said cam followers so that pins carried by said pockets fall out prior to reaching said discharge station, and means for moving said cam gate between said positions.

4. A bowling pin mechanism in accordance with claim 3 wherein said last mentioned means includes a solenoid operably connected to move said cam gate, and control means for actuating said solenoid, said control means including a pin counter operably connected to actuate said solenoid to open said gate in response to elevation of a predetermined number of pins to said discharge station.

5. A bowling pin mechanism in accordance with claim 4 wherein said control means is cyclically operable to actuate said solenoid to elevate a predetermined number of pins upon each cycle of operation and to preclude elevation of bowling pins at times other than during a cycle.

6. In a bowling pin elevating mechanism, the combination of a continuously driven rotary conveying means operable to elevate pins from a pin receiving station to a pin discharge station spaced above said pin receiving station, said conveying means including a conveyor having a plurality of pockets each adapted to receive a pin at said pin receiving station and carry such pin upwardly toward said pin discharge station along an arcuate path of travel including an intermediate portion in which such pin can fall back into said pin receiving station unless retained in its pocket, a plurality of pin retaining members each mounted on said conveyor for movement between an operative pin-retaining position operative to prevent a pin from falling from said conveyor and an inoperative pin discharge position allowing a pin to fall from said conveyor, means positively operable on all said retaining members in said operative position to remove the same from said operative pin-retaining position on arrival thereof at said discharge station and means selectively operable on each of said retaining members during movement thereof from said receiving station to said discharge station either to place it in said operative position or to effect its remaining in said inoperative position, and cyclically operable means for controlling the last-mentioned means to effect delivery of a predetermined number of pins to said discharge station upon each cycle of operation.

7. For use in a bowling pinspotting machine, the combination of a pin conveyor for lifting pins from a pin receiving station adjacent the bottom of the pit of a bowling alley installation upwardly to a pin discharge station spaced above the pin receiving station, said pin conveyor including at least one pocket adapted to receive a bowling pin at said bowling pin receiving station and carry such pin along a path of travel toward said pin discharge station, said path of travel including an intermediate portion in which the weight of the pin biases the pin away from said pocket, retaining means carried by said conveyor and comprising at least one member movable between a first position engageable with a pin for retaining the pin in said pocket and a second position operable to allow such pin to fall from said pocket, means for either moving said retaining member into said first position throughout said portion of the path of travel to retain the pin in the conveyor until delivered to said discharge station or effecting the remaining of said retaining means in said second position during said portion to preclude the elevation of the pin to said discharge station, and means positively effecting the movement of said retaining members previously moved to said operative position from said operative position to said inoperative position in passing said discharge station.

8. In a bowling pinspotting machine for use in a bowling alley installation having a pit at one end thereof, the combination of a conveyor for lifting objects from a

receiving station adjacent the bottom of the pit to a discharge station spaced above said receiving station, said conveyor including at least one pocket adapted to receive a pin at said receiving station and carry such pin along a path of travel including a portion located before said discharge station in the direction of travel and in which the weight of the pin biases it out of said pocket, retaining means movable between a first position in which the pin is engaged and thereby retained in said pocket and a disengaged second position allowing the pin to fall out of said pocket, means for moving said retaining means between said positions, and means controlling said moving means prior to arrival at said discharge station and during movement through said portion of the path of travel to selectively position said retaining means in either

of said positions, whereby pins are either retained in said pockets or fall therefrom prior to arrival at said discharge station, said controlling means including means effecting positioning of all said retaining means in said second position at said receiving and discharge stations.

References Cited in the file of this patent

UNITED STATES PATENTS

2,767,983	Holloway et al.	Oct. 23, 1956
2,786,679	Strauss et al.	Mar. 26, 1957
2,911,218	Scherzinger	Nov. 3, 1959
2,967,708	Huck et al.	Jan. 10, 1961
2,999,690	Huck	Sept. 12, 1961
3,004,760	Congelli	Oct. 17, 1961