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This invention relates to bowling pin pickup apparatus and more particularly to bowling pin pickup apparatus adapted for use in a pin setting machine.

The general object of the invention is to provide new and improved bowling pin pickup apparatus.

An object of the invention is to provide improved apparatus for lifting standing pins from a bowling alley bed and for replacing said pins on said bed in exactly the same spots they previously occupied.

Another object is to provide a mechanism for picking up standing pins, such mechanism comprising a vertically movable frame having a vertical central opening therethrough, through which a pin may be set on the alley bed, and having two pairs of horizontally extending pickup bars, the bars of each pair being in an inoperative withdrawn position and extending substantially at a right angle to each other which constitutes a normal position, and means for causing said bars to revolve toward each other with a scissors-like action to an operative position wherein they straddle the neck of the pin.

Another object is to provide a pickup mechanism having a vertically movable frame having a vertical central opening therethrough, through which a pin may be set on the alley bed, a closure in said opening, said closure being vertically movable relative to said frame, operable to clamp a standing pin to the alley bed and movable to an out of the way position, said closure being operable when actuated by a clamped pin, to cause said bars to move toward each other to straddle the neck of the pin.

Another object is to provide in a pickup mechanism having at least two pivotally mounted pickup bars, pin actuated means for causing said bars to revolve toward each other to straddle the neck of a standing pin, such means comprising a rotatably mounted tube having a spiral slot therein and having one of said pickup bars mounted thereon, a second tube rotatably mounted within said first tube, said second tube having another of said bars mounted thereon and having a reverse spiral slot therein, an actuating member extending through the spiral slots in said tubes, and pin actuated means for causing said actuating member to move upward with respect to said tubes to cause said bars to move toward each other to straddle the neck of the pin.

Other objects and advantages will be apparent from the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is a plan view of bowling pin pickup apparatus constructed in accordance with my invention, with parts broken away to show the underlying structure;

Fig. 2 is a vertical section through the apparatus of Fig. 1 along the line 2--2 of Fig. 1;

Fig. 3 is a vertical section through the apparatus of Fig. 1 taken at right angles to Fig. 2 along the line 3--3 of Fig. 1;

Fig. 4 is a vertical section along the line 4--4 of Fig. 1:

Fig. 5 is a fragmentary section along the line 5--5 of Fig. 1, showing the latching mechanism used to retain the apparatus in pin grasping position;

Fig. 6 is a fragmentary vertical section along the line 6--6 of Fig. 1, showing in detail the mounting of the pickup bars;

Fig. 7 is a perspective view of the apparatus showing its position at the time it first contacts a standing pin;

Fig. 8 is a perspective view of the apparatus with the pickup bars at an intermediate point in the process of grasping a standing pin; and

Fig. 9 is a perspective view of the apparatus with a pin grasped and lifted from the alley bed.

While my invention is susceptible of embodiment in many different forms, I have shown in the drawings and will herein describe in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

In the drawings only one of my improved pickup units is illustrated, it being understood that in a bowling machine there would be ten of these units mounted upon a common grid frame or structure 20 in a triangular pattern coinciding with the pin spots on a bowling alley bed. This grid structure 20 is vertically movable above said alley bed, and may be of the type illustrated and described in more detail in the copending application of George A. Montooth and Albert M. Bowen filed March 26, 1946, Serial Number 657,238, and in my copending application for "Pinsetting Machines" filed March 24, 1947.
Serial Number 736,643, and a similar grid structure is shown in the copending application of Jack Van Horn Whipple and Albert L. Odmark for “ Bowling Pin Setters” filed March 24, 1947, Serial Number 736,682. The grid structure 20 is described as apparatus not shown here, but which may be the same as illustrated and described in the above mentioned applications.

The purpose of providing ten individual pick-up units similar to the single pickup unit illustrated is to make it possible to remove one or more of the units from the common grid frame, or structure to make repairs and replacements easily and in a minimum of time. Furthermore by making use of self-actuating individual units, only those pickup units which come into contact with standing pins are actuated, thus eliminating unnecessary wear on units which are not operable to pick up standing pins during a given pickup operation, and eliminating unnecessary inter-connecting mechanisms.

Referring more particularly to Figs. 1, 2 and 3, each pickup unit consists of a rectangular frame 2, mounted in the position opening in the grid frame or structure 20. Each of said frames is made up of a substantially rectangular top plate 21 and a substantially rectangular bottom plate 22 spaced apart and held in place by four spacing rods 23, 24, 25 and 26. The top plate 21 is cut away in its center along the line 21a to permit pins to be set through the apparatus in the manner illustrated in the aforementioned Mon-tooth, Whipple and Odmark applications, and the bottom plate 22 is also cut away in its center along the line 22a so that pins may be set through the unit.

A closure is mounted within the vertical central opening through said frame, this closure comprising a substantially rectangular pressure plate 30 which also has a central portion cut out along the line 31. Within the cut out portion are a pair of doors 31a and 31b, hingedly mounted by means of spring loaded hinges 32 and 33 so that said doors are retained in the horizontal position of Figs. 1, 2 and 3, and may swing downwardly to the passage of a pin during the pin setting operation, but are prevented from swinging upwardly beyond the horizontal position shown, by contact with the bottom surface of the pressure plate 30. Said doors act to clamp a standing pin upon the alley bed, and a cushion of rubber or other resilient material is affixed to the bottom of each of the doors as shown in Figs. 2 and 3 at 34a and 34b.

The entire closure assembly is mounted for relative movement with respect to the frame. To permit this movement a plurality of racks 35a, 35b, 35c, 35d, 35e and 35f are mounted upon the pressure plate 30, and cooperating gears 36a, 36b, 36c, 36d, 36e and 36f are carried by the frame, each of said gears being suspended from the top plate 21 by means of one of the brackets 37a, 37b, 37c, 37d, 37e and 37f, and each of said brackets is carried by one of the racks. Oppositely facing pairs of gears are interconnected on three sides of the structure by shafts 38g so that the pressure plate 30 is always retained in a horizontal position with respect to the frame. The weight of the closure maintains the closure apparatus down in the relative position shown in Figs. 2, 3 and 7 and when the supporting grid structure 20 is driven downwardly the trap doors 31a and 31b in the closure engage the head of a pin 27 standing on the alley bed either on or off its normal spot 28 (Figs. 7, 8, 9) on the alley bed 29. As the grid 20 carrying the frame continues to move downwardly, the closure is held by the head of the clamped pin against further downward movement, thereby moving upwardly with respect to the frame. An actuating ring 40 (Figs. 2, 3 and 4) is rotatable in a manner to be hereinafter described, and is spaced above the pressure plate 30, as shown in Fig. 7. When the pressure plate moves upwardly with respect to the frame a short distance it contacts such actuating ring and moves said ring upwardly with respect to the grid frame.

A pair of outer tubes 41a and 41b are mounted between the upper and lower plates adjacent opposite corners of the frame, and within each of these outer tubes is an inner tube 42a and 42b respectively. Both inner and other tubes are rotatably mounted between said upper and lower plates 21 and 22, each inner tube carrying at its ends peg bearings 43, the upper of each of these peg bearings being journaled into a bearing collar 44 carried by the plate 21, and the lower of each of said peg bearings being journaled into a bearing collar 45 carried by the plate 22, as shown in Fig. 4. The outer tubes 41a and 41b are rotatably mounted on their respective inner tubes 42a and 42b.

Thus it will be seen that the outer and inner tubes 41a and 41b and said ring carries a collar 46 (Figs. 3, 4 and 5) surrounding each of the outer tubes 41a. Within an enclosure between each collar 46 and the ring 40 an actuating member 47 is movably enclosed, each of these actuating members comprising a pin, one of which extends through the slots in each of pair of tubes 41a, 41b, and 42a, 42b. It will be obvious that as the pressure plate 30 causes the actuating ring 40 to slide upwardly on the tubes 41a and 41b, the actuating pins 47 will cause the inner and outer tubes 41a and 41b to turn to the right while the spiral on the inner tubes 42a and 42b turns to the left. The spiral slots are so arranged that each of the tubes rotates through an angle of 45 degrees, or a total of 90 degrees for each pair of tubes, and the straight or vertical upper portion of each of said slots allows for overtravel without any of the tubes rotating through more than a 45 degree angle.

Two pairs of pickup bars 50a, 50b and 50c, 50d are provided, one of said bars being carried by each of the said tubes 41a and 41b, and each of said bars extend horizontally in the vertical central opening in the frame and are mounted upon the respective tubes as shown best in Fig. 6. Thus each of the outer tubes 41a carries a pickup bar 50 on a bracket 51, and each of the inner tubes 42a and 42b carries a pickup bar mounted below the bar on the outer tube on the pickup bars of each pair being movable about a common axis and arranged so that they extend substantially at a right angle to each other along the outer edges of the bottom plate 22 when they are in an inoperative withdrawn position. Con-
sequently when the tubes 41 and 42 rotate as above described, the pickup bars of each pair revolve with a scissors-like movement from their withdrawn or right angle position to an operative or parallel position, and since the pickup bars are spaced apart at their mounting end a distance slightly greater than the width of the neck portion in the pin, as the bars move they will straddle the neck of the standing pin which is clamped to the alley bed by trap doors 31a and 31b above described. The term "straddle" is being used herein to indicate the operative position of each pair of pickup bars adjacent the neck of the standing pin and on opposite sides thereof regardless of whether one or both of said pickup bars contact the neck of the pin. Since the inner and outer tubes 41a, 41b, 42a and 42b are rotatably mounted on the frame and since the actuating pins 47 are movably held between the actuating ring 40 and the collars 46, the pickup bars of each pair will swing into any position required to straddle the neck of a pin regardless of whether the pin is on its normal spot on the alley bed or is shifted therefrom as shown in Fig. 4. Fig. 4 illustrates a portion of the range of movement of such pickup bars. The straight portions 41a', 41b', 42a' and 42b' of the respective spiral slots in each of the tubes allows for an over-travel of pin 47 for latching and holding the pins and also compensates for any warping in the lengths of the pins.

It will be seen from the foregoing that each pair of bars will independently straddle the pin and will clamp and move the pin up from the alley bed upward movement of the frame. Each pair of bars constitutes an operative pair of pickup device for a pin which is located within an area of the alley bed which is determined by the effective pin engaging length of the bars, and to provide a maximum pin pickup area two pairs of bars may be used.

Fig. 5 shows a latching device to hold the apparatus in clamped position while the pins are lifted from the alley bed, there being two of these latching devices in opposite corners of the frame. Each latching device comprises a latch member 60 which is attached to the alley bed by a bracket being secured to a strap 61a which is fastened to one of the actuating collars 46 and the actuating ring 40 by means of a screw 62. This latch may be of the same type described and illustrated in the Montooth and Bowen application above referred to, the latch member 60 being slidably retained in a notch 60c by means of a pin 63 and provided between a terminal latching position and a terminal unlatching position, this movement being aided by an over-center spring 64 which is attached at one end to the latch member 60 by means of a pin 65 and is attached at the other end to the bracket 61 by means of a pin 66. As described in the above mentioned application the latch is adapted to become engaged and disengaged alternately, so that when the latch member moves up with respect to the frame when the bowing pin 27 is first clamped and grasped by the pickup bars 50 the latch becomes engaged, thus holding the pickup bars 50 in a pin grasping position so that the pin may be lifted from the alley bed. When the alley is cleared and the grid structure 20 moved down to re-set the pin on the alley bed the latch is again disengaged as the pressure plate forces the actuating ring 40 and actuating collar 45 upwardly, and the latch is released. The straight upper portion of the slots 41a', 41b' and 42a' allows an over-travel to permit this release.

In each of the individual pickup units described there is necessarily a "dead pin" area between the units in which a pin may stand where it will be beyond the reach of the pickup units. In order to prevent the apparatus from descending on such a misplaced pin a dead area detector grid 70 is provided. This grid may be connected to electrical contacts (not shown) in the machine in such a manner that if any pin is knocked off spot a sufficient distance to be beyond the reach of the pickup arms and in the "dead pin" area, it will be contacted by this grid and an electric signal sent to stop the pin setting machine so that the pickup apparatus is not damaged. The dead area detector grid is supported from the bottom plate 21 by means of a plurality of pins as the pin 71. This pin connection being spring loaded by a spring 72 to permit movement between the detector grid and the balance of the apparatus in the event the pin strikes such grid.

In Figs. 7, 8 and 9 the pickup unit is shown in several positions as it goes through a cycle of operation. In Fig. 7 the apparatus is shown just as the trapdoors 31a-31b in the pressure plate 30 contact the head of a standing pin 27 and start to clamp such pin to the alley bed. In this position the pressure plate 30 is at the bottom of its range of movement with respect to the frame, and the arms of each pair of pickup arms 50 are in withdrawn position substantially at right angles to each other. In the apparatus shown in Figs. 7, 8 and 9 the pin is illustrated as being a substantial distance from its normal pin spot 25, since one of the features of my apparatus is that it will handle such off spot pins and replace them in the same position on the alley bed from which they were taken.

In Fig. 8 the pressure plate has clamped the bowling pin to the alley bed, the frame carried by the grid structure 20 has continued its downward movement, and consequently the pressure plate has moved upwardly relative to said frame. In the course of this movement said pressure plate has contacted the actuating ring 40, causing said ring also to be engaged upwardly with respect to the frame, and the actuating pins 47 have moved upwardly in the slots 41a', 41b' and 42a', 42b' causing the outer tubes 41 to rotate in one direction and the inner tubes 42 to rotate in the opposite direction so that the arms of each pair of pickup arms have revolved toward each other with a scissors-like action. In Fig. 8 one of the arms of each pair has contacted the neck of the pin so that the motion of these arms stops. However since the entire tube assembly is rotatable, the arms of each pair continue to move in until the arms of each pair straddle the neck of the standing pin and the latch 60 becomes engaged.

The entire apparatus may then be raised as shown in Fig. 9, the latch mechanism holding the pickup arms 50 in pin grasping position. Since the head end of a bowling pin is wider than the neck portion of said pins, as the apparatus moves upward the arms which straddle the neck of the pin contact the wider head portion of the pin and the pin is lifted from the alley bed. After the alley has been cleared the grid structure 20 is again lowered, pressing the pin against the alley bed causes the pressure plate again to move upward with respect to the frame so that the latch 60 is disengaged, and as the grid structure 20 is again raised the weight of the pressure
plate together with the action of the actuating pins 47 in the slots in the tubes 41 and 42 causes the pickup bars 50 to revolve outwardly until the bars of each pair are again at right angles to each other.

I claim:

1. Bowling pin pickup apparatus comprising, in combination, a vertically movable frame having a vertical central cut out portion, two pairs of horizontal pickup bars each pivotally mounted in horizontal planes of different elevations on said frame for movement thereto, a first tube rotatably mounted on said frame below said closure upon said frame for relative movement thereto, two pairs of horizontal pickup bars pivotally mounted on said frame below said closure for movement in a horizontal plane, each pair of bars being mounted at opposite points near the edge of said frame and extending into said cut out portion, means holding the bars of each pair substantially at a right angle to each other wherein the bars of each pair substantially at a right angle to each other, pin actuated means operable as a function of the relative movement between said closure and frame for revolving the bars of each pair to a position substantially parallel to each other to straddle the neck of a standing pin, and a latch for retaining said bars in closed position during a pickup operation.

2. Bowling pin pickup apparatus comprising, in combination, a vertically movable frame having a vertical central cut out portion, a first tube rotatably mounted on said frame below said closure for movement in a horizontal plane, each pair of bars being mounted at opposite points near the edge of said frame and extending into said cut out portion, means holding the bars of each pair substantially at a right angle to each other, and pin actuated means operable as a function of the relative movement between said closure and frame for revolving the bars of each pair toward each other to straddle the neck of a standing pin.

3. Bowling pin pickup apparatus for use in a bowling alley comprising a vertically movable frame having a vertical central cut out portion, a bowling alley cut out portion, said closure being operable to clamp a standing pin to the floor of a bowling alley and being movable to an out of the way position, gear and rack means for mounting said closure on said frame for vertical movement thereto, two pairs of horizontal pickup bars pivotally mounted on said frame below said closure for movement in a horizontal plane, each pair of bars being mounted at opposite points near the edge of said frame and extending into said cut out portion, means holding the bars of each pair substantially at a right angle to each other, and pin actuated means operable as a function of the relative movement between said closure and frame for revolving the bars of each pair toward each other to straddle the neck of a standing pin, and a latch for retaining said bars in a closed position during a pickup operation.

4. Bowling pin pickup apparatus for use in a bowling alley comprising, a substantially rectangular vertically movable frame having a vertical central cut out portion, a substantially rectangular closure in said cut out portion, said closure being operable to clamp standing pins to the floor of a bowling alley and being movable to an out of the way position, a plurality of vertical racks carried by said closure at the corners thereof, a plurality of gears carried by said frame and engaging said racks, said racks and gears support-
extending through the spiral slots in each pair of tubes and being rotatable about the axis of said tubes, both pairs of pickup bars being in an inoperative withdrawal position when said actuating members are positioned at the base of their respective slots, and means for causing said actuating members to move upwardly in said slots and causing each bar to move to an operative position the rotatable mounting of said tubes and actuating member providing a pivotal mounting for said bars whereby each bar may move an unequal distance.

10. Bowling pin pickup apparatus for use in a bowling alley comprising, a substantially rectangular vertically movable frame having a vertical central cut out portion, a closure in said cut out portion, said closure being operable to clamp a standing pin to the floor of a bowling alley, and being movable to an out of the way position, a plurality of vertical slots carried by said closure at the corners thereof, a plurality of gears carried by said frame and engaging said slots, said slots and gears supporting said closure upon said frame for relative movement thereto, a first outer tube rotatably mounted on said frame, said tube having a spiral slot therein and having a pickup bar mounted thereon, a first inner tube rotatably mounted on said frame within said outer tube, said inner tube having a spiral slot therein which is inclined in a direction opposite to said first slot and having another pickup bar mounted thereon, a second outer tube rotatably mounted on said frame at a point opposite said first tube, said second tube having a spiral slot therein and having a pickup bar mounted thereon, a second inner tube rotatably mounted on said frame within said second outer tube, said second inner tube having a spiral slot therein which is inclined in a direction opposite to the slot in said second outer tube and having another pickup bar mounted thereon, an actuating ring slidably mounted on each of said outer tubes, said actuating ring having a central cut out portion, a pair of actuating members rotatably carried by said ring, one of said members extending through the spiral slots in each pair of tubes, both pairs of pickup bars being in an inoperative withdrawn position when said actuating members are positioned at the base of their respective slots, relative movement of said closure with respect to said frame causing said ring to slide upward on said tubes and causing the bars of each pair to rotate toward each other to straddle the neck of a standing pin.

11. Bowling pin pickup apparatus comprising, in combination, a vertically movable frame having a vertical central cut out portion, a first tube rotatably mounted on said frame, said tube having a spiral slot therein and having a pickup bar mounted thereon, said spiral slot extending across an angle of 45 degrees on the periphery of said tube and having a vertically straight upper portion, a second tube mounted on said frame within said first tube, said second tube being rotatable with respect to said first tube and having a spiral slot therein which is inclined in a direction opposite to said first slot and having a pickup bar mounted thereon, an actuating member extending through the spiral slots in said tubes and being rotatable about the axis of said tubes, said pickup bars being in an inoperative withdrawn position when said actuating member is positioned at the base of said slots relative movement of said closure with respect to said frame causing said actuating member to move upwardly in said slots and causing each bar to move to an operative position the rotatable mounting of said tubes and actuating member providing a pivotal mounting for said bars whereby each bar may move an unequal distance.
for the bars whereby said bars may move an unequal distance.

12. Bowling pin pickup apparatus comprising, a vertically movable frame, a pair of pickup bars, first means for rotatably mounting each of said bars at one end thereof for movement about a common axis on said frame, said bars being spaced at their mounting ends a distance substantially equal to the width of the neck of a standard bowling pin, and second means operative at said axis for revolving said bars about said axis from an inoperative position wherein said bars extend at an angle to each other to an operative position wherein said bars extend substantially parallel to each other, said second means permitting unequal movement of said bars upon the blocked movement of either of said bars.

GEORGE A. MONTOOTH.

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