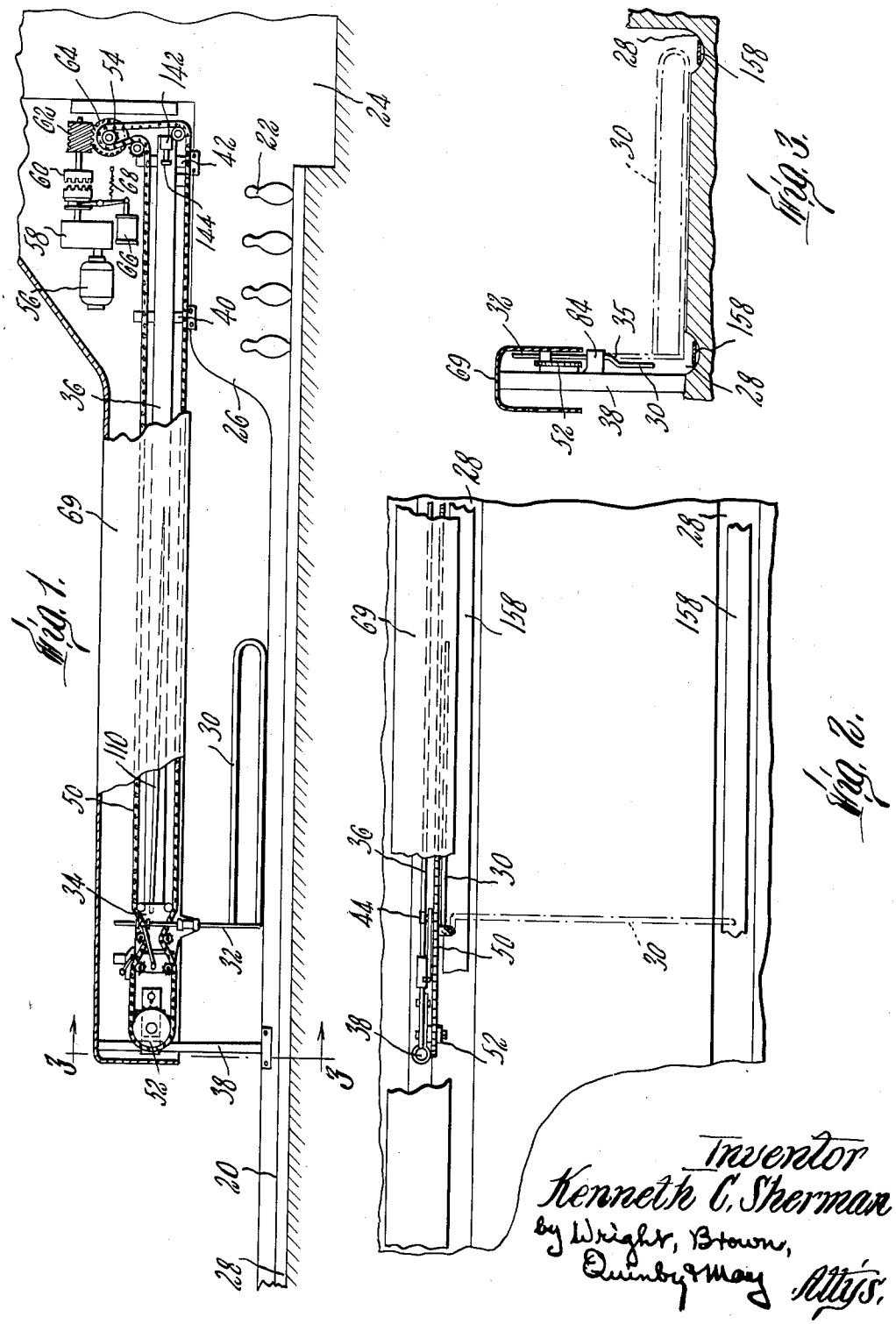
Feb. 21, 1956 K. C. SHERMAN 2,735,681

SWEEP MECHANISM FOR BOWLING ALLEY

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SWEEP MECHANISM FOR BOWLING ALLEY

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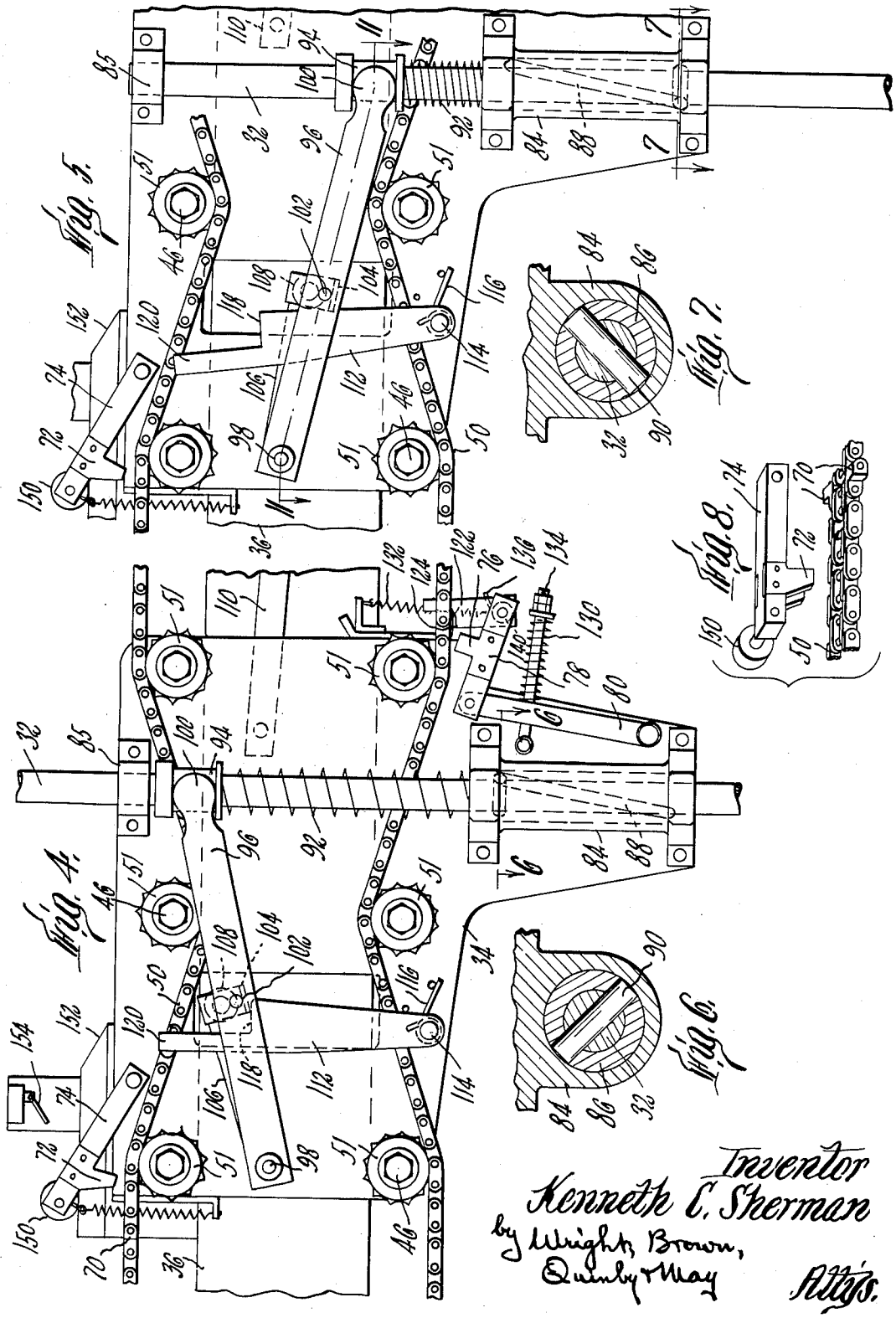


Fig. 5.

Fig. 7.

Fig. 8.

Fig. 4.

Fig. 6.

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SWEEP MECHANISM FOR BOWLING ALLEY

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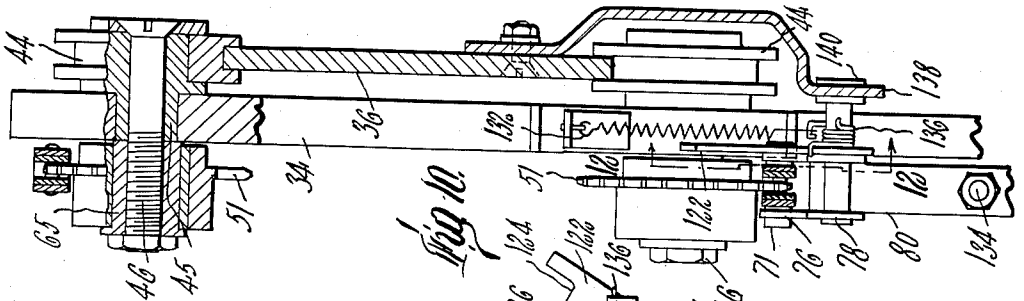


Fig. 10.

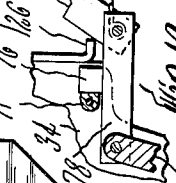


Fig. 12.

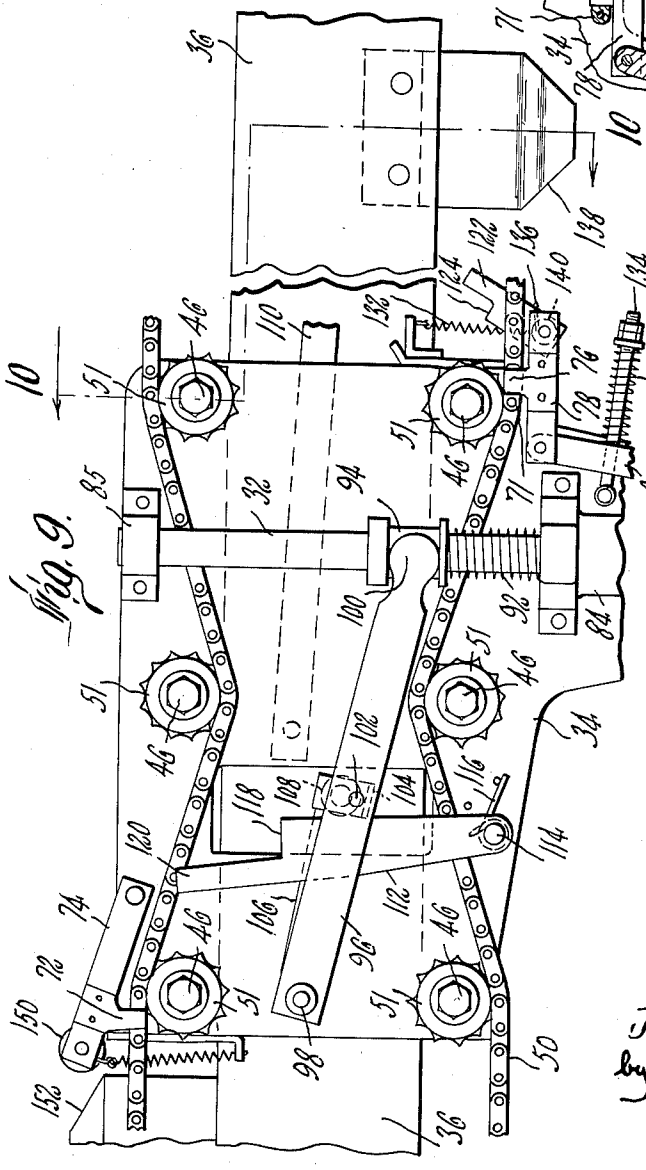


Fig. 9.

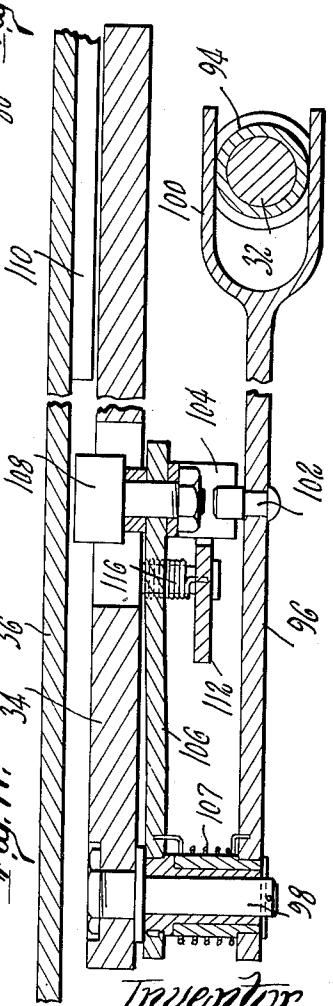


Fig. 11.

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2,735,681

SWEEP MECHANISM FOR BOWLING ALLEY

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Application May 1, 1952, Serial No. 285,401

3 Claims. (Cl. 273—54)

This application is a continuation in part of my co-pending application Serial No. 746,596, filed May 7, 1947, pursuant to which Patent No. 2,670,205 was issued February 23, 1954.

This invention relates to improved mechanism for mechanically sweeping "dead-wood" from a bowling alley after a ball has been thrown to knock down some or all of the pins. Various mechanisms for this purpose have been designed for use with pin setting machines of the kind which pick up the standing pins after each ball except the last in a frame has been thrown and which automatically replace such pins after the alley has been swept. Mechanism of this description is shown and described in said Patent No. 2,670,205.

An object of the present invention is to provide a sweeping mechanism which is relatively simple, inexpensive, and effective in operation. The sweeping mechanism hereinafter described is quick-acting and quiet, and can be synchronized with the operations of the pin-setting carriage to protect the latter from injury by balls which may be improvidently thrown when the carriage is in its lowered position for gripping or releasing standing pins.

For a more complete understanding of the invention reference may be had to the following description thereof and to the drawings, of which—

Figure 1 is an elevational view of a side wall or kick-back of an alley, showing a sweep mechanism mounted thereon;

Figure 2 is a fragmentary plan view of the alley and part of the mechanism shown in Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is an enlarged elevational view of some of the mechanism shown in Figure 1;

Figure 5 is a portion of the same, showing the parts in a different position of operation;

Figure 6 is a section on the line 6—6 of Figure 4;

Figure 7 is a section on the line 7—7 of Figure 5;

Figure 8 is a perspective view of a catch member and part of the driving chain shown in Figures 4 and 5;

Figure 9 is an elevational view of the mechanism shown in Figures 4 and 5, the parts being in another position;

Figure 10 is a section on the line 10—10 of Figure 9;

Figure 11 is a section on the line 11—11 of Figure 5; and

Figure 12 is a fragmentary section on the line 12—12 of Figure 10.

The rear portion of a bowling alley, including part of the pit, is illustrated in Figure 1. As shown, the alley surface 20 supports a set of pins 22 adjacent to the pit 24. On each side of the pit is a kick-back 26. According to the present invention mechanism is provided for sweeping dead-wood from the alley into the pit after a ball has been thrown. This mechanism is intended for use in conjunction with pin setting apparatus not herein shown but fully shown and described in Patent No. 2,670,205. The pin setting apparatus not only

serves to set up a set of pins in their proper places on the alley but also picks up the pins left standing after each ball except the last in a frame has been thrown. Such remaining pins are held above the alley by the pin setting apparatus so that the sweep can be operated to clear the alley and gutters 28, whereupon the pin setting mechanism returns the lifted pins to their positions on the alley floor. After the last ball of a frame has been thrown, the sweep operates to clear the alley and gutters completely prior to the setting up of a fresh set of pins.

As shown, the sweep mechanism comprises a sweeper blade 30 which may conveniently be in the form of an open tubular frame including two elongated horizontal members spaced one over the other and secured to a vertical stem 32 which is supported by a carriage 34. The lower portion of the stem 32 is offset from the upper portion as at 35 (Figure 3) so that when the blade 30 is in its inactive position it will be as far off to one side as possible so as not to distract the bowler. By using tubing for the blade 30, lightness of weight and strength are obtained together with maximum visibility of the rear portion of the alley and the pins therein when the blade is in its sweeping position, that is, extending transversely across the alley.

The carriage is adapted to run on a horizontal rail 36 which may be supported by any suitable means such as standards 38, 40 and 42, the latter two being mounted on a side wall or kick-back of the alley. To guide and support the carriage 34 it is provided with flanged rollers 44 each of which engages the top or bottom edge of the rail 36 as illustrated in Figure 10, these rollers being rotatable on axles 45 secured to the carriage by suitable bolts 46. To drive the carriage 34 together with the blade 30 through rearward sweeping strokes toward the pit and forward return strokes back to the position shown in Figure 1, an endless cable 50 is provided. This cable may conveniently be in the form of a chain which passes around an idle sprocket wheel 52 carried by the standard 38 and also around a sprocket wheel 54 at the rear end of the alley, the wheel 54 being driven by any suitable apparatus such as a motor 56 connected through a reduction gearing 58 and a clutch 60 to a worm gear 62 which meshes with a gear wheel 64 fixed on a common shaft with the sprocket wheel 54. The chain, as indicated in Figure 1, has two horizontal stretches respectively above and below the rail 36. When the chain is in motion the upper stretch moves toward the forward end of the alley while the lower stretch moves toward the pit. The portions of the chain adjacent to the carriage 34 are maintained in proper relation to cooperating elements on the carriage by engagement with a number of sprocket wheels 51 which are supported by and freely rotatable on shouldered nuts 65 which are screw threaded on the bolts 46. When the alley is in use the motor 56 is constantly driven but the chain cable 50 is operated only when desired, being connected to the motor when the clutch 60 is operated by means of a solenoid 66. When the solenoid is deenergized a spring disengages the clutch to disconnect the cable 50 from the motor. Any other suitable driving means for the cable 50 may be employed, the mechanism illustrated being by way of example only. A suitable hood or cover 69 is mounted over the entire mechanism to protect it from dust and dirt and also to deaden the noises incident to operation.

For driving the carriage 34 back and forth on its sweeping and return strokes, two spaced drive links 70 and 71 are included in the chain cable 50. These links, one of which is illustrated in Figure 8, have lateral projections on the sides thereof which are adapted to engage catch elements 72 on a pivoted arm 74 (Figure

4) carried by the carriage 34. Engagement of one of the driving links with the catch elements 72 causes the carriage to move forward on its return strokes. For the rearward sweeping strokes, catch elements 76 are carried by an arm 78 which is connected by a rockable link 80 to the carriage 34.

The sweeper blade 30 is secured to or integral with its vertical stem 32 which extends slidably through an elongated bearing member 84 mounted on the carriage 34 and also through an upper bearing member 85. The bearing member 84 contains a fixed sleeve 86 having a pair of helical slots therein one of which is indicated at 88 in Figures 4 and 5. A fixed pin 90 extends through the stem 32 with both its ends projecting from the stem to ride in the slots 88. The slots are so arranged that when the blade is in an elevated position as indicated in Figure 1, it extends parallel to the length of the alley and is disposed along a side of the alley. When the blade is released to descend from its elevated position to a position in which it is almost in contact with the surface of the alley, as indicated in broken lines in Figure 3, it is caused to swing through an arc of 90° out to its active position across the alley by the pin and slot connection between the stem 32 and the fixed sleeve in the bearing member 84. A compression spring 92 is provided around the stem 32 between the top of the bearing member 84 and the bottom of a spool 94 which is fixed on the stem 32. This spring cushions the descent of the stem and sweeper blade when they are released as hereinafter described. For the support of the sweeper blade a lever arm 96 is pivotally mounted as at 98 on the carriage 34, this lever arm having a forked end 100 (Figure 11) the extremities of which are rounded as indicated in Figures 4, 5 and 9 to fit rotatably between the rims of the spool 94. Thus when the lever 96 is swung upward it elevates the sweeper blade, and when it is released, the sweeper blade is permitted to descend by gravity. The lever arm 96 is provided with a fixed pin 102 which normally rests on a shelf 104 carried by an auxiliary arm 106 pivoted as at 98 on the carriage 34. A spring 107 on the pivot pin 98 engages the arms 96 and 106 to press the pin 102 yieldingly against the shelf 104. When the auxiliary arm 106 is rocked upward, it carries with it the arm 96 and the sweeper blade 30. The sweeper blade however is free to rise independently of the arm 106 at any time, so that if it is struck by a thrown ball when in its extended position across the alley, it can readily yield sufficiently to avoid injury thereto by simultaneously turning and rising sufficiently to absorb the initial impact of the ball while deflecting the ball to a gutter. For operation of the auxiliary arm it is provided with a roller 108 arranged to ride on the upper edge of an elongated cam member 110 mounted on a side of the rail 36 as hereinafter described. When the lever arms 96 and 106 are in their elevated position as shown in Figure 4, they are normally held in such position by a trigger member 112 which is pivotally mounted as at 114 on the carriage 34 and is provided with a spring 116 which tends to rock the trigger member in a clockwise direction about its pivot as illustrated in Figure 4. The member 112 has a shoulder 118 which is adapted to engage under the shelf 104 so as to maintain the arm 96 in its elevated position. When the trigger member 112 is rocked in a counterclockwise direction so as to disengage the shoulder 118 from the shelf 104, the arms 96 and 106 are allowed to descend together with the stem 32 and the sweeper blade 30. To trip the trigger member 112 an extension 120 thereof is disposed beside the chain cable 50 so as to be engageable by the driving link 71 when the trigger member is in its upright position as shown in Figure 4.

For driving the carriage on a rearward sweeping stroke, it is desirable that the catch element 76 be engaged by the second driving link 71 so that the leading drive link 70 will be ready at the end of the sweeping stroke to engage the catch elements 72 for the return stroke. In order to enable the leading link 70 to pass the catch elements 76 when the chain 50 is started in motion, these catch elements are held out of the path of the link 70 until it has passed. For this purpose a trigger member 122 is attached to the free end of the arm 78. The member 122 has a shoulder 124 which is normally engaged under a fixed lug 126 shown in Figure 12. The shoulder 124 is held against the lug 126 by springs 130 and 132 which act on the linkage consisting of the trigger member 122, the arm 78 and the link 80 as shown in Figures 4 and 9. The spring 130 is carried by a bolt 134 attached to the carriage and tends to rock the link 80 in a counterclockwise direction. The spring 132 is attached to the outer end of the arm 78 and tends to swing this arm and the trigger member 122 upward. A third spring 136 (Figure 10) tends to rock the trigger member 122 counterclockwise as in Figure 4.

The operation of a sweep cycle is initiated by the pressing of a switch button (not shown) located in a position convenient to the bowler. The circuit thus closed energizes the solenoid 66 causing the clutch 60 to engage so that the motor drives the chain 50. The first of the drive links 70 at this time is in the position shown in Figure 4, that is, to the left of the catch arm 74 from which it has previously been released at the close of the previous return stroke of the carriage. As the chain 50 travels, the first drive link 70 moves around the idle sprocket wheel 52 and then toward the rear until it engages the trigger member 122. This engagement rocks the trigger member so as to disengage its shoulder 124 from the lug 126, permitting the spring 132 to rock the arm 78 upward so as to bring the catch elements 76 into the path of the lateral projections of the second drive link 71, this position of the arm 78 being shown in Figures 9 and 12. When the second drive link 71 engages the catch elements 76, it starts a sweeping stroke of the carriage toward the rear along the rail 36, the abruptness of the start being cushioned by the spring 130 which permits the linkage carrying the catch elements to yield. The sweeping stroke ends when the arm 78 reaches a fixed stop-cam 138 which is mounted on the rail 36 and has a portion in the path of a roller 140 carried by the outer end of the arm 78. The cam 138 as shown in Figure 9 slopes downward, causing the arm 78 to rock downward when the roller 140 rides thereon, thus operating to disengage the catch elements 76 from the drive link 71. A buffer 142 is mounted on the rail 36 in such a position as to be engaged by the carriage 34 when the arm 78 is being rocked by the cam 138 to disengage the carriage from the driving link 71. The buffer has a spring pressed plunger 144 which cushions the carriage at the end of its sweeping stroke and starts it back on its return stroke. The spacing between the drive links 70 and 71 is such that at this instant the first drive link 70 engages the upper elements 72 and drives the carriage on its return stroke toward the position shown in Figure 1. At the beginning of the sweeping stroke of the carriage the sweeper blade is released as hereinbefore described so as to swing out across the alley. This position is maintained by the blade through its sweeping stroke and the initial portion of the return stroke. As the blade travels toward the pit it pushes ahead of it any standing or fallen pins which may be on the alley or in the gutters. If desired, suitable conveyors may be provided in the gutters to keep them clear of dead-wood. These conveyors may be endless belts having a rearwardly driven stretch 158 in the bottom of the rear portion of each gutter. The sweeper blade, with or without the assistance of conveyors 158, delivers the dead-wood into the pit where it is handled by automatic mechanism (not herein shown) for resetting the pins.

When the roller **108** carried by the arm **106** reaches the rear end of the sloping cam member **110**, it rides on the upper edge thereof and is gradually elevated until it reaches the forward end of this cam member. As the roller **108** is gradually raised by the cam member, it swings the arms **106** and **96** upward, thus elevating the sweeper blade **30** and causing it to swing back to its normal position along the side of the alley. When the arms **106** and **96** have been swung to their uppermost position, the shelf **104** is above the shoulder **118** of the trigger member **112** so that the latter is rocked in a clockwise direction by the spring **116** and the shoulder **118** engages under the shelf to maintain the sweeper blade in its elevated position. Meanwhile the arm **74** which carries a roller **150** reaches a fixed cam **152** which is in the path of the roller. The arm **74** is thus swung upward and remains on the cam to disengage the catch elements **72** from the drive link **70** and the carriage comes to a stop. At the same time the roller **150** operates a switch **154** to break the circuit through the solenoid **66** which is thereupon denergized permitting the spring **68** to disengage the clutch **60** to stop further travel of the chain **50**. While this is happening the momentum of the chain and its driving mechanism carries the link **70** a short distance beyond the catch elements **72** to some such position as that indicated in Figure 4. The carriage is then ready for the next sweeping operation to be initiated by the bowler pressing the starting button again.

I claim:

1. In combination with a bowling alley, sweep means comprising a blade, means normally supporting said blade in an idle position extending rearward from said supporting means along a side of the alley and substantially above the level of the alley, means for releasing said blade for limited downward movement under gravity, means for causing said blade to swing outward and forward across the alley as it descends, means automatically operating to move the blade along the alley through a sweeping stroke and then in the reverse direction through a return stroke to its initial position, and means for raising and swinging the blade during said return stroke.

2. In combination with a bowling alley, a support extending along one side of the alley, an endless cable carried by said support, means for driving said cable, a carriage carried by said support and movable thereon back and forth along said side of the alley, means for operatively connecting said carriage with said cable to be driven thereby, a sweep blade carried by said carriage and movable up and down relatively thereto, means normally maintaining said blade in an elevated idle position along said side of the alley, means for releasing said blade for descent by gravity to the level of the alley, and means responsive to downward movement of the blade to swing the blade outward and forward to a sweeping position across the alley.

3. In a bowling alley having a kick-back and a pit at its rear end, mechanism for sweeping fallen pins into the pit, said mechanism comprising a horizontal rail mounted on said kickback, a carriage slidable on said rail, a sweeper supported by said carriage, said sweeper having a vertical stem and a horizontal blade secured to the lower end of the stem and normally extending from the stem toward the rear of the alley, means on said carriage normally supporting said sweeper in an elevated position, means for releasing said sweeper to descend to a lower position, cam means operating to rotate said stem about 90° to swing said blade out to a position transverse with respect to the alley when said sweeper descends from its elevated position and to swing said blade back to its normal position parallel with the axis of the alley when it is raised to said elevated position, an endless chain having two stretches supported parallel to said rail, means for driving said chain, and means on said carriage and chain cooperating to connect said carriage to said stretches of chain successively to cause the carriage and sweeper to travel back and forth along the rear portion of the alley.

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