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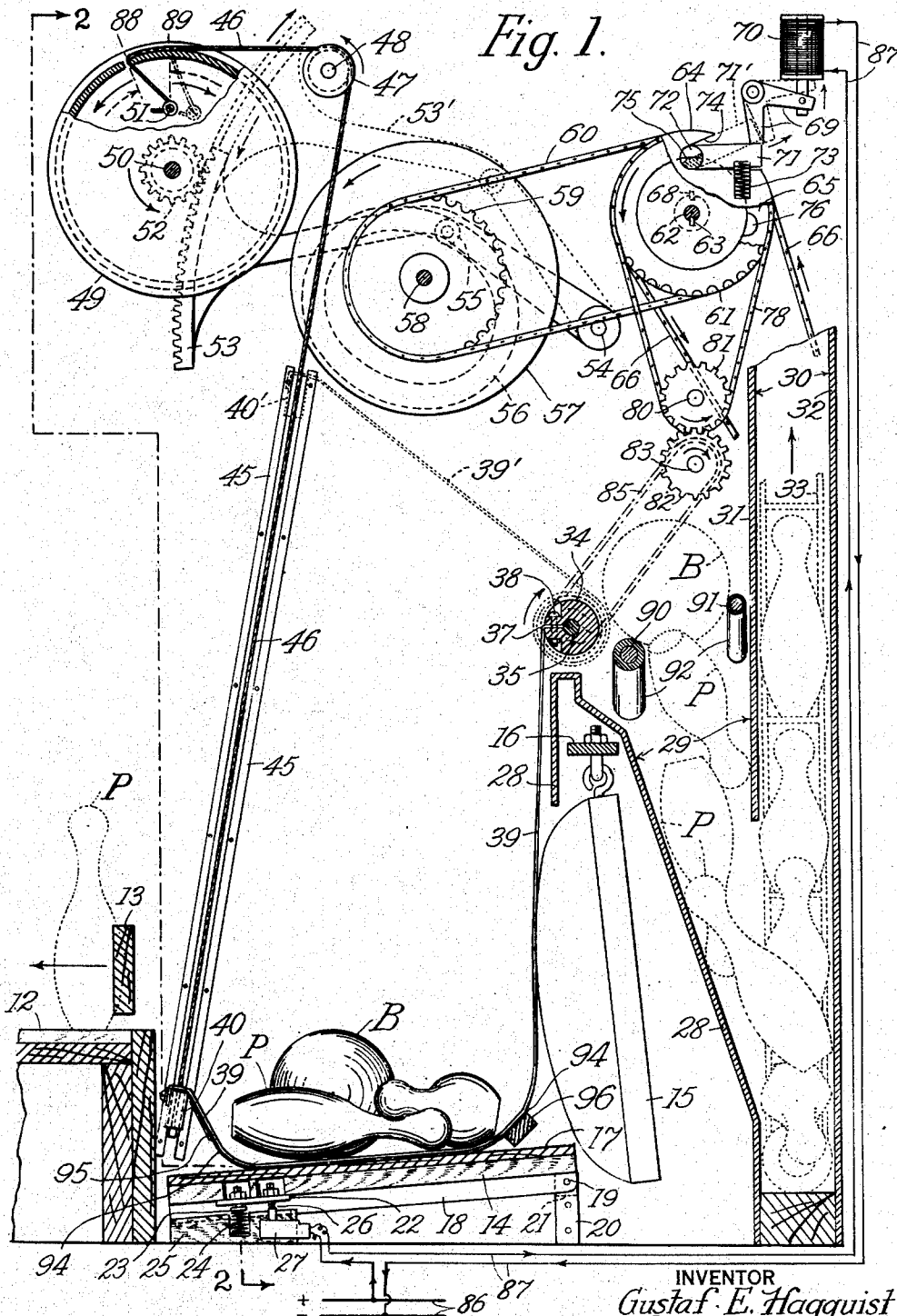
G. E. HAGQUIST

2,293,018

PIT ELEVATOR FOR BOWLING PIN SETTING MACHINES

Filed March 9, 1940

2 Sheets-Sheet 1



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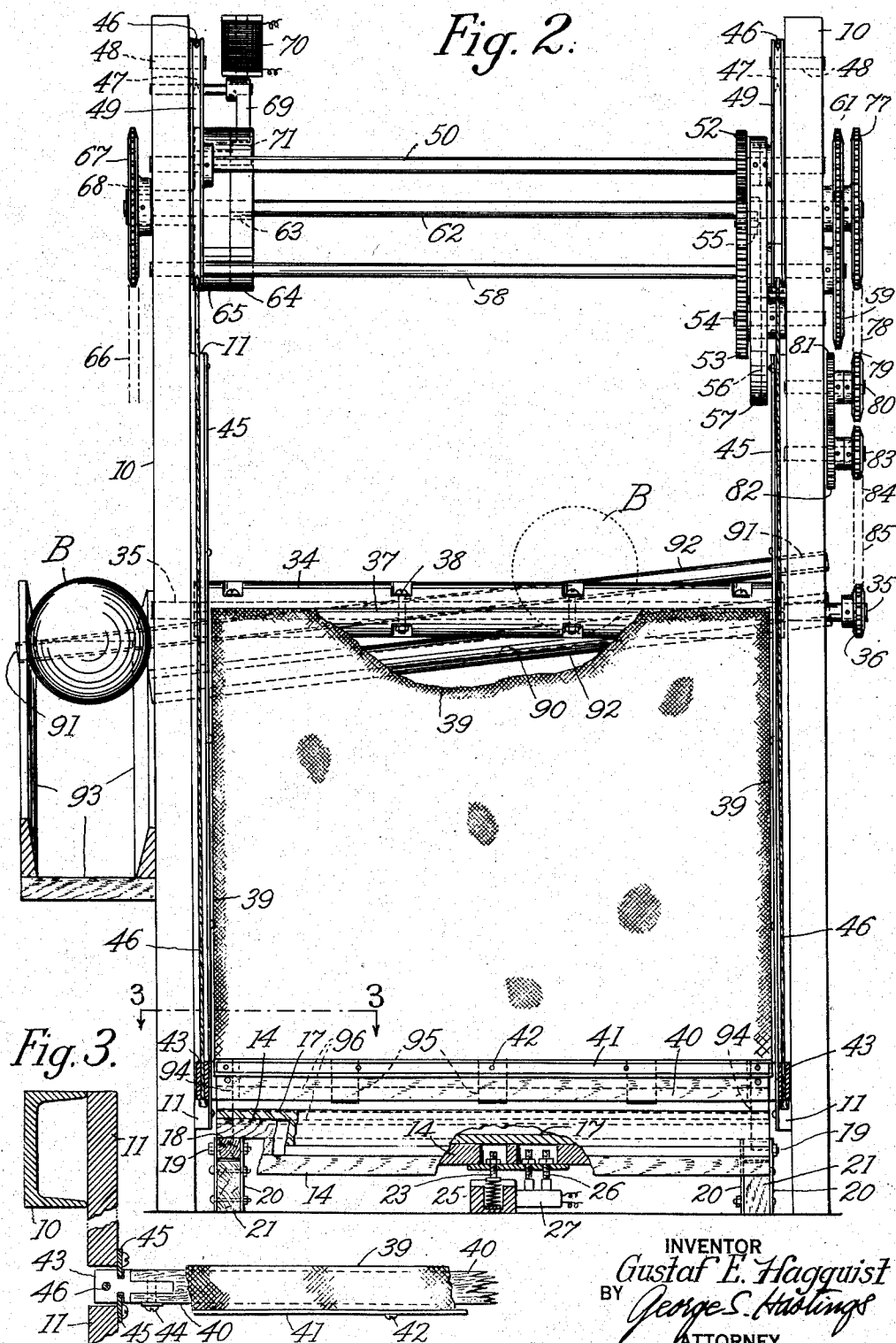
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2 Sheets-Sheet 2

Fig. 2.



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PIT ELEVATOR FOR BOWLING PIN
SETTING MACHINESGustaf E. Hagquist, Brooklyn, N. Y., assignor to
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20 Claims. (Cl. 273—43)

This invention relates to bowling pin setting machines and more particularly to improvements in mechanism for conveying fallen pins and bowling balls from the pit portion of an alley to distributing devices which distribute them for the continued playing of the game.

In practically all of the bowling alleys now in use, at the rear of the pit is located a bumper usually placed to absorb the impact of the bowling ball as it rolls off the end of the alley. It often happens whenever a fast ball is thrown that pins are projected with considerable force from the end of the alley, fly across the pit, strike the bumper and jump back on the alley where they strike and knock down standing pins. This, of course, creates an unsatisfactory advantage in favor of a fast bowler.

According to my invention I have provided means which effectively cuts down the rebounding of pins from the bumper and accordingly it is an object of my invention to provide mechanism which will tend to eliminate any undesired advantage arising because of rebounding of bowling pins from the bumper and, therefore, provide means which will tend to make the play of the game more uniform regardless of the speed with which a ball is thrown.

It is also an object of my invention to provide a pit elevator mechanism which coacts with the bumper of a bowling alley in lessening the rebounding of bowling pins after the throwing of a ball together with means for correctly positioning the elevator in the pit and guiding balls and pins onto the elevator.

In automatic bowling pin setting machines of known types, the problem arises with respect to conveying pins and balls from the pit as to the prevention of pins dropping during their transportation and interfering with the operation of the machine. My invention further consists in the provision of mechanism which makes it practically impossible for pins to fall from the conveying means which removes pins and balls from the pit due to the fact that the pins are held within an elongated substantially pocket-shaped elevating means during their removal from the pit, and wherein the pins tend to align themselves with their lengths all extending in one direction or crosswise in the pocket formed in the elevating means.

I have also taken into consideration and provided mechanism to prevent balls or pins from dropping or rolling back on the alley so that at all times they are positioned in such a way in the conveying device that they are under full

control and will be properly ejected at a given time into redistributing means.

It is an object of this invention to provide improved and simplified means for removing the ball and fallen pins swept into the pit of the bowling alley after a throw in order to return the ball to a bowler and the pins to a distributing chamber whence they are transferred to distributing means ready to be set up again for further play.

While in some automatic bowling pin setting machines it has been proposed to furnish means for automatically returning pins and balls, there has always been the possibility that they would be subjected to considerable wear and tear and possible damage and also it has been difficult to handle the pins and balls without considerable noise. This is particularly true in those cases where pins and balls have been dropped after being conveyed from the pit for redistribution. It is a further object of my invention, therefore, to provide a device for handling balls and bowling pins and transferring them from the pit of a bowling alley with the least possible damage to the pins and with a material reduction in the amount of noise incident thereto.

It is an additional object of my invention to provide a bowling alley and means operative under the control of a thrown ball for causing a flexible pit elevator to transfer pins and balls from the alley pit to a point from which they can be redistributed wherein the balls are sent back to the player and the pins are shunted to a storage device.

The invention further consists of the provision of a flexible pit elevator or apron of at least alley width located in front of the bumper in the pit of a bowling alley, and means for raising the apron vertically with respect to the pit and discharging therefrom pins and balls which may be carried by the apron.

An additional object of my invention consists of the provision of a flexible pit elevator and means for securing the elevator between its supports in such a manner that it forms an elongated pouch or pocket extending from one side of the pit to the other for substantially aligning fallen pins during their transportation from the pit to a point of redistribution.

A further object of my invention consists in the provision of a flexible pit elevator secured to two relatively movable members, one mounted at the front of the pit and one at the rear, and means for effecting relative movement between the two supports and forming an elongated pouch

for lifting bowling pins and balls, wherein the alley of the pit elevator tends to align the pins with their lengths extending in one general direction.

My invention further consists in the provision of a fabric or cloth-like pit elevator supported by two relatively movable members which hold the elevator in pouch forming arrangement during the lifting operation of the pins and balls and wherein means are provided for winding up the elevator to eject the pins and the balls from the elevator.

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 side elevation of the pit end of an automatic bowling machine, showing the arrangement of the improved pit elevator mechanism;

Figure 2 is an end elevation of the same, from line 2—2 of Figure 1; and

Figure 3 is a top view from line 3—3 of Figure 2 showing the construction of the apron cross-bar and the tracks for raising the same.

Referring to Figures 1 and 2, the improved pit elevator is supported by vertical channel beams 10 to which the side walls 11 of the pit are attached. The pins P are set up in any desired playing arrangement at the end of an alley 12 over which a member 13 is adapted to sweep in order to clear the alley of fallen pins after a ball B has been thrown or to remove unwanted standing pins and "deadwood" after throwing of the last ball allotted for each frame. The pins swept from the alley into the pit fall upon an apron 39 which extends over a movable platform or table 14. The thrown ball, after bouncing back from a bumper 15 mounted on a cross-bar 16 at the rear of table 14, comes to rest upon apron 39. The table 14 is covered by a rubber mat 17 which not only protects the balls and pins from damage, but also deadens the noise of impact. In the preferred form of my embodiment table 14 is provided with side beams 18 by which its rear end is hinged by bolts 19 carried by plates 20 attached to support blocks 21. Near its forward end, the under-side of table 14 carries a metal plate 22 to which is adjustably attached a plunger 23 resting upon a spring 24 embedded in a support block 25. The plate 22 also carries two adjustable contacts 26 adapted to close a normally open switch 27 on block 25 when the table 14 is moved into switch closing position by a ball falling thereon.

Located adjacent the top and to the rear of the bumper 15 is a partition 28 which may be slightly inclined and which with walls 31 forms a pin receiving chamber 29 for directing pins into a pin transfer chamber 30 between partitions 31 and 32 and the side walls 10 of the machine. A conveyor 33, located in the chambers, carries pins P to the pin storage magazine (not shown) from whence they are transferred at desired periods by means (not shown) to the bed 12 of an alley. Near the top of partition 28 and the entrance of chamber 29 is placed an apron supporting device such as a horizontal roller 34 mounted on a shaft 35 supported in suitable bearings formed in the side frames 10 of the machine and turnable by a

sprocket 36 fast thereto. This roller is provided with an angular slot 37 in which is secured, as by screws or bolts 38, one end of the pit apron 39. The apron is preferably made of any suitable flexible material or fabric, such as, rubber, canvas or other cloth, or may be made up of a laminated fabric such as canvas and rubber. Since the material will be subjected to rigorous wear and tear because of the impact of balls and pins, it is essential that it be strong and durable. As shown in Figure 2, the apron may be constructed of a single piece of material of alley width or, if desired, it may be built up of several sections sewed or otherwise secured together.

In Figure 1, the apron is shown in its pin and ball receiving position in which it extends downwardly from roller 34 in front of bumper 15 to and along mat 17 of the pit table 14 and near the rear end of the alley 12 is fastened to a cross member of bar 40 formed of wood or other suitable material. The apron 39 may be attached to the bar 40 in any desired manner but it has been found that screws 42 perform this function with considerable satisfaction. It will be seen, therefore, that the apron accommodates itself readily to the pit and provides a maximum amount of space available for the reception of bowling pins and balls.

The ends of cross-bar 40 are located for engagement and travel in slots 45a of guide rails which are mounted on the side walls 11 of the pit. For best results, the ends of bar 40 are provided with metal pieces secured thereto by screws, or if desired, cam rollers or other devices might be used. Bar 40 is suspended by cables 46 which run over guide pulleys 47 mounted on shafts 48 secured for rotation in the side frames 10 of the machine to sheaves 49 on a shaft 50 to which shafts they are fastened by screws 51.

The shaft 50 is turned by a gear 52 meshing with a gear segment 53 fulcrumed on a shaft 54 and having a roller 55 in engagement with a track 56 of a cam 57 on cam shaft 58. The cam shaft 58 has a sprocket 59 driven through a chain 60 by a sprocket 61 on the main shaft 62 to which is affixed, by a key 63, the driven member 64 of a one revolution clutch, the driving member 65 of which runs loose on shaft 62 and is continuously driven by a chain 66 on a sprocket 67 fixed thereto by a key 68.

The clutch 64, 65 is held in disengagement by the bell crank armature 69 of a solenoid 70 which, by a lever 71 turning on a stud 72, depresses a spring 73 in member 64 when the said solenoid is not energized. But when a momentary current flows through this solenoid, its armature 69 is pulled up, releasing the lever 71, thereby allowing spring 73 to raise the same to dotted position 71' against a stop surface 74 of member 64, in which position one edge of a half round portion 75 of stud 72 engages with a groove 76 in member 65, thereby interlocking the members 64 and 65 and driving the sprocket 61. After cessation of the momentary current in solenoid 70, the armature 69 drops back into the full line position so that, after one revolution of the clutch, the lever 71 slides back under bell crank 69 and depresses spring 73, thus disengaging the clutch. The driving clutch and control mechanism is of the same general construction as that shown and described in co-pending application, Serial No. 248,215, filed December 29, 1938, by R. E. Rundell, for Pin removing and guard mechanism for bowling alleys.

While the clutch is in engagement, a sprocket

77 on shaft 82, through a chain 28 and a sprocket 78 on shaft 80, drives a gear 81 meshing with a gear 82 on a shaft 83 having a sprocket 84 which, through a chain 85, drives the sprocket 36 on roller shaft 35.

As soon as a ball lands on pit table 14, the latter is thereby tilted and the switch 27 is closed by the contacts 26, thus sending current from the line 86 through wires 87 to solenoid 70 and engaging the clutch. The cam 57 then begins to turn, but its track 56 is so arranged that the segment 53 does not move until a portion of the cycle, sufficient for the in stroke of sweep 13, has elapsed whereupon on the back stroke of sweep 13, the gear 52 is turned by segment 53 which swings into the dotted position 53' and back into the full line position 53 at each turn of cam 57 so as to revolve sheaves 49 counterclockwise from position 88 to position 89 and back to position 88. The diameter of the sheaves 49 is so chosen that this movement pulls up just enough of cables 46 to raise the cross bar 40 in position 40' at the upper end of guide tracks 45, bringing the apron 39 to the dotted position 39' in which the balls and pins lifted by the apron will roll down in chamber 29, the roller 34 having at the same time been turned by sprocket 36 in the clockwise direction by the proper amount to wind up the rear end of apron 39.

Across the entrance of chamber 29 are mounted two inclined rods 90 and 91, spaced so that the pins P can freely pass between them but that the ball B is arrested by them. To protect the falling ball from injury, these stop rods are covered by rubber tubes 92. Having landed on rods 90 and 91, the ball B rolls down the incline into a chute 93, which carries it back to the front of alley 12, while the pins P fall to the bottom of chamber 29 and are picked up by the conveyor 33.

When the roller 34 is rotated and winds the apron 39 about it, it is possible when the apron is to be unwound or returned to the pin receiving position (as shown in Figure 1 in full lines) that it may be not properly distributed. In order to prevent such a possibility I have provided a weight member which may take the form of a metal bar 96 which is fixed to the apron, is apron wide in length, and extends from one edge of the apron to the other. This is so placed with relation to the end of the apron fixed in roller 34 that in normal inoperative position it is located adjacent the bottom of bumper 15 (as shown in Figure 1).

In order to make it relatively impossible for a ball or pin to move back onto either the alley bed or gutter prior to or during the upward movement of the elevator, I have provided plates 95 fixed to support 40 by screws 42, which plates may be formed of spring metal, such as thin steel, and extend out from support 40 and beneath the apron 39, so that a ball or pin coming in contact with the apron 39, which is held away from support 40 by plates 95, will naturally slide down the apron and be deposited at some distance from the support. Therefore, during the upward movement of the apron there will be little tendency of the pins or balls to roll back onto the alley or into the gutter.

In order to forestall the possibility of a pin or ball working out of the apron during the lifting operation and in order to strengthen the active edge portions of the apron during the transfer of pins and balls to the point of redistribution, I have found that thin metal strips 94, which may be made of spring steel or like material, placed

along the edges of the apron between support 40 and weight 96 act as efficient reinforcements in preventing any unsatisfactory operation of the apron during the lifting of pins and balls. These strips may be secured to the apron in any desired manner, such as by riveting or bolting.

The invention above described may be varied in construction within the scope of the claims, for the particular device, selected to illustrate the invention, is but one of many possible concrete embodiments of the same. It is not, therefore, to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. A pit elevator for a bowling pin setting machine comprising a flexible member arranged to be positioned slackly longitudinally of and across the pit of a bowling alley to form a pocket for receiving pins and balls thereon, relatively movable devices supporting the ends of said member for movement into and out of said pit, one of said devices including a traveling support fixed to said member, means for locating said support adjacent the end of said alley and below the level of the pin supporting face thereof, and means for moving said devices to raise said member from said pit and deliver balls and pins carried thereby to a point of discharge.

2. In a bowling pin setting machine for a bowling alley having a pit and a bumper at the rear of said pit, a flexible pin and ball handling member extending downwardly in front of said bumper and across said pit to a point adjacent the end of said alley for receiving pins and balls thereon, means for fixing one end of said member against movement above said bumper, a support movable to and from said end of said alley mounting the other end of said member for vertical movement relative to said fixed end of said member, and mechanism for moving said support upwardly from said point adjacent said alley for discharging pins and balls carried thereby to the rear of said bumper.

3. In a bowling pin setting machine for a bowling alley provided with a pit, a flexible member extending slackly across said pit and forming therein a pin and ball receiving pocket, movable devices connected to the ends of said flexible member, and means operative upon the arrival of a ball on said member for causing relative movement between said movable devices for lifting one end of said member higher than the other, and tautening said member between said movable devices to remove pins and balls from said pit and discharge said pins and balls from said member.

4. In a bowling pin setting machine for a bowling alley having a pit, a movable element mounted in said pit, a flexible pit wide member extending longitudinally of said pit above and coacting with said element, movable devices connected to the ends of said flexible member, means operative upon the arrival of a ball on said member for causing said element to effect relative movement between said movable devices for lifting said member, and means for lifting one of said devices higher than the other to remove balls and pins from said pit.

5. In a bowling pin setting machine a pit, a movable member mounted in said pit, an elongated flexible device extending longitudinally of and across said pit and over said member, movable means connected with the ends of said flexible device, and means operative upon the arrival of a ball on said device to move said member for

causing relative movement between said movable means for lifting said device to convey a ball and pins from said pit, said movable means including mechanism for shortening the length of said device to discharge the pins and ball carried by said device.

6. Bowling pin handling mechanism for the pit of a bowling alley having a pin supporting surface comprising a flexible apron positioned in said pit to receive fallen pins and balls, movable devices secured to each end of said apron, means for effecting relative movement between said devices to form an elongated generally U-shaped pin and ball carrying pocket in said apron extending transversely of said pit when said apron is positioned therein, means for locating one of said devices in the front end of said pit and below said pin supporting surface, means for guiding pins and balls onto said apron, and means for raising one of said devices higher than the other to cause said apron to assume substantially a straight line position above said pit for discharging pins and balls therefrom.

7. Pit elevating mechanism for a bowling pin setting machine comprising an alley bed, a pit, a flexible apron positioned in said pit to receive bowling pins and balls, a movable member fixed to one end of said apron adjacent the alley bed, a roller fixed to the other end of said apron and mounted above the other end of said pit, and means for moving said member and rotating said roller to lift said apron with the pins and balls positioned thereon.

8. Pit elevating mechanism for a bowling pin setting machine comprising an alley bed, a pit, a flexible apron in said pit to receive bowling pins and balls, a movable member fixed to one end of said apron adjacent the alley bed, a roller fixed to the other end of said apron and mounted above the other end of said pit, guides mounted on the sides of said bed, means on said movable member coacting with said guides, and means for moving said member and rotating said roller to lift said apron with the pins and balls positioned thereon.

9. Pin handling mechanism for the pit of a bowling alley comprising an elongated flexible apron forming a pin receiving pocket extending across the pit from side to side, means for raising one end of said apron to lift pins from said pit, side supports located at each side of said pit, guide means mounted for substantially vertical movement for controlling the position of said apron while it is being raised, and means for shortening said apron to cause said apron to assume substantially a straight line position downwardly and rearwardly inclined relative to said pit and thereby discharge said pins from said apron.

10. In pit elevating mechanism for a bowling pin setting machine, a support movably mounted in the front of said pit for vertical movement, a rotatable member mounted above and to the rear of said pit, an elongated apron secured to said support and said rotating member, means for moving said support upward, and means for rotating said roller simultaneously with the movement of said support for lifting said apron.

11. In pit elevating mechanism for a bowling pin setting machine, a support mounted for vertical movement located in the front of said pit, a pit bumper, a rotatable member mounted above said bumper and to the rear of said pit, an elongated apron of substantial pit width extending across said pit and over said bumper secured to

said support and rotating member, trip mechanism positioned to be engaged by a ball rolling on to said apron in said pit, and means set into operation by said trip mechanism for moving said support upward and for rotating said roller substantially simultaneously with the movement of said support for lifting said apron and for shortening said apron to discharge said ball and any pins carried thereby.

12. In a bowling pin setting machine for use with an alley having a bed, a pit and a bumper at the rear of said bed, a roller mounted above said bumper and the rear of said pit, a support mounted adjacent the end of said bed and in front of said pit, an elongated belt extending downwardly from said roller in front of said bumper and over said pit secured to said support, means for simultaneously lifting said support and turning said roller to lift said belt, and means for continuing the motion of said roller after said support reaches its uppermost limit to wind up the slack in said belt and make it taut.

13. A bowling pin setting machine pit elevating mechanism for use with a bowling alley having a pit adjacent a pin supporting surface comprising an elongated apron extending across and located in said pit, rigid supports mounting the ends of said apron and positioning it in operative relation relative to said pit, means to move said supports to raise said apron, means for positioning one of said supports in the front of said pit adjacent and below the plane of said surface for allowing fallen pins and balls to drop into said pit, means for raising one of said supports higher than the other, said last-named means being so constructed and arranged that the apron assumes a pocket like formation during the movements of said apron towards discharge position and at said position is made taut.

14. In a pit elevating mechanism for bowling pin setting machines, a flexible apron extending across an alley located in said pit, a support for one end of said apron, guides fixed to said support to guide pins and balls into said pit and onto said apron, means to raise and lower said apron to eject said balls and pins therefrom, and means to position said apron in said pit.

15. In a pit elevating mechanism for use with a bowling alley having a pit at one end thereof, a flexible apron located in and extending across said pit, a support for one end of said apron, guides fixed to said support to guide pins and balls into said pit and onto said apron, means to raise and lower said apron to eject said balls and pins therefrom, and a weight mounted on said apron for controlling the descent of the apron into said pit.

16. In a pit elevating mechanism for use with a bowling alley having a pit at one end thereof, a flexible apron located in and extending across said pit, a support for one end of said apron, guides fixed to said support to guide pins and balls into said pit and onto said apron, means to raise and lower said apron to eject said balls and pins therefrom, a weight mounted on said apron for controlling the descent of the apron into said pit, and a member extending between said weight and support for reinforcing the edges of said apron.

17. In a pin setting machine for a bowling alley having a bed and a pit at one end thereof, a pit elevator for transferring pins and balls from said pit to a point of discharge, said elevator comprising a flexible member located in said pit, means positioning one end of said member above

and to the rear of said pit and the other end adjacent and below the pin supporting surface of said bed to form a generally U-shaped pocket for receiving said pins and balls, and means for moving said member clear of said pit to deliver said balls to said point of discharge, said means including means for causing said member to assume substantially a straight line position relative to said pit during its movement to said point of discharge.

18. A pit elevator for a bowling pin setting machine for an alley having a pin supporting bed comprising a flexible apron positioned in said pit, means located at the rear and above said pit supporting one end of said apron, a movable support located at the front of said pit below the pin supporting surface of said bed having secured thereto the other end of said apron, and means for raising said support higher than said means supporting the other end of said apron to lift said apron and deliver pins and balls carried thereby to a point of discharge.

19. Pin handling mechanism for the pit of a bowling alley having a bumper at the rear thereof, comprising an elongated, pit wide, flexible apron secured above and extending downwardly in front of said bumper to the front of said pit adjacent the end of said alley, said apron form-

ing a generally U-shaped pin and ball receiving receptacle in said pit between said bumper and end of said alley, means for raising said apron from said pit to lift pins and balls therefrom, guide means controlling the position of said apron while it is being raised, and means for causing said apron to assume substantially a straight line downwardly inclined position when raised to its uppermost limits for ejecting said pins and balls carried thereby backwardly over the top and to the rear of said bumper.

20. A pit elevator for a bowling alley comprising trip mechanism located in said pit, a bumper positioned at the rear of said pit, an elongated belt like member fixed at one end above said bumper and extending downwardly in front of said bumper above and across said mechanism to a point adjacent the front of said pit, a support mounting the front end of said member for vertical movement relative to said pit, and means rendered operative by the arrival of a heavy object in said pit and on said member for operating said mechanism including, means for raising said support higher than the end of said member fixed above said bumper to effect the discharge of said object from said member.

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