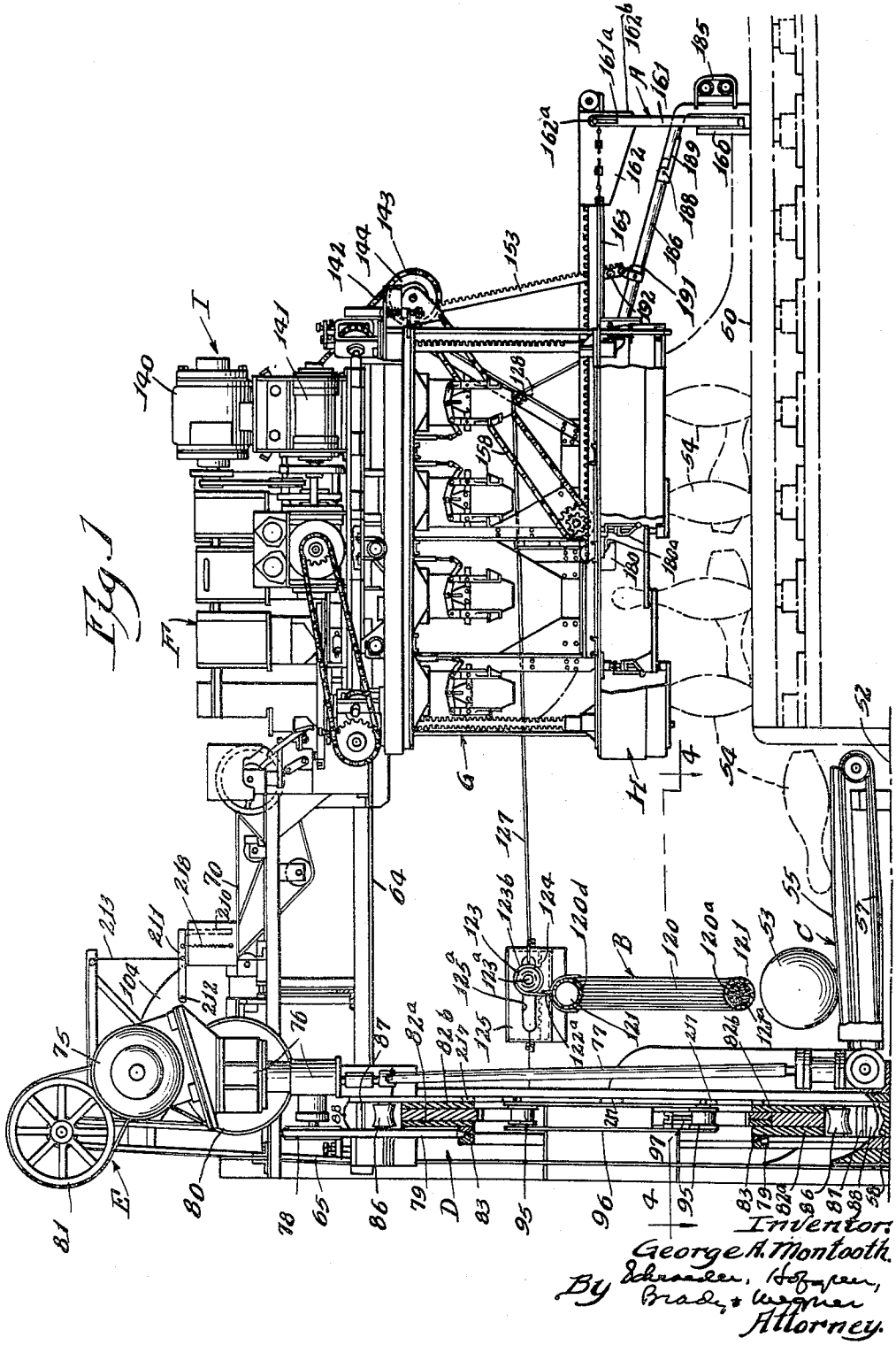
Nov. 22, 1960 G. A. MONTOOTH 2,961,237

BALL AND PIN HANDLING MECHANISM

Original Filed Jan. 14, 1948 7 Sheets-Sheet 1

Fig. 1



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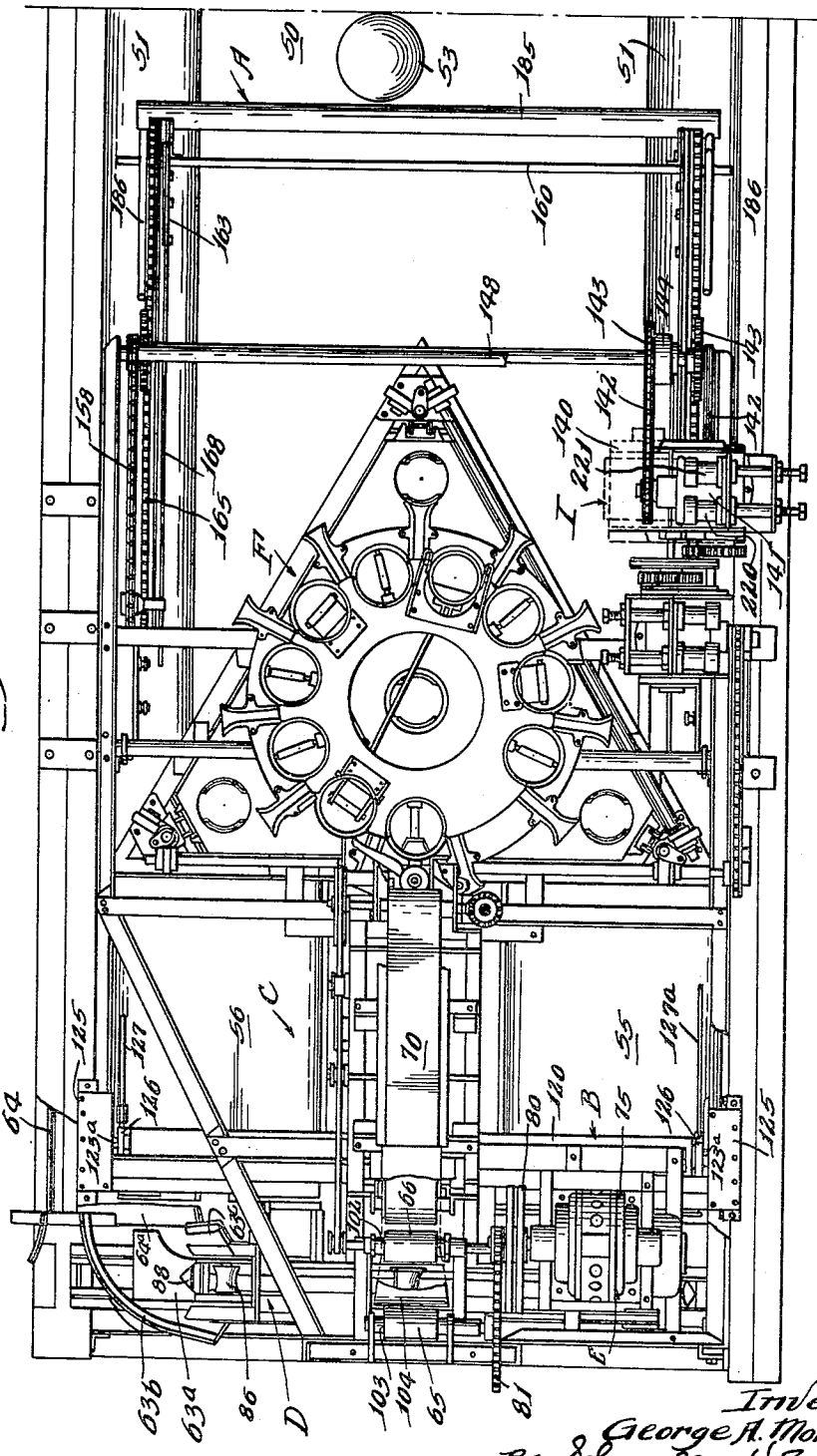
BALL AND PIN HANDLING MECHANISM

Original Filed Jan. 14, 1948 7 Sheets-Sheet 2

Fig. 2



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BALL AND PIN HANDLING MECHANISM

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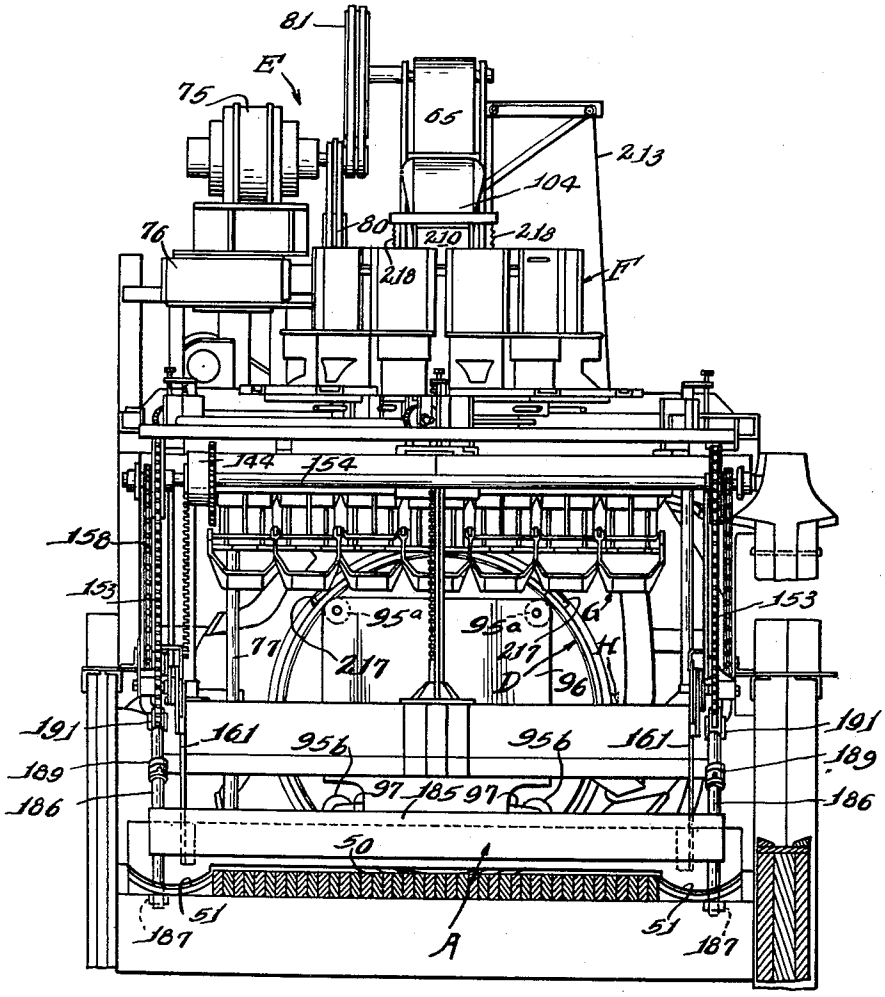
Fig. 3



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BALL AND PIN HANDLING MECHANISM

Original Filed Jan. 14, 1948 7 Sheets-Sheet 4

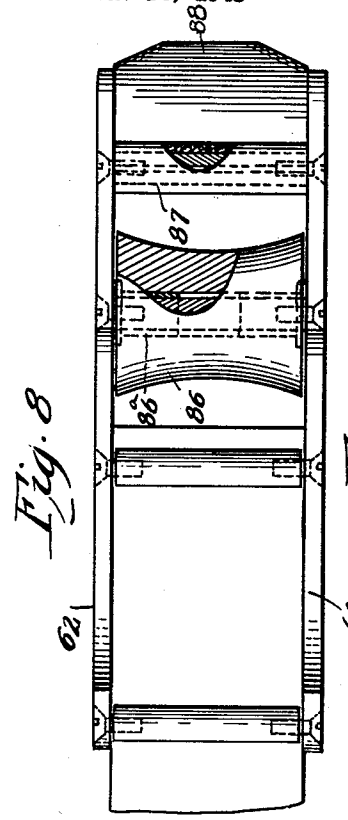

Fig. 8

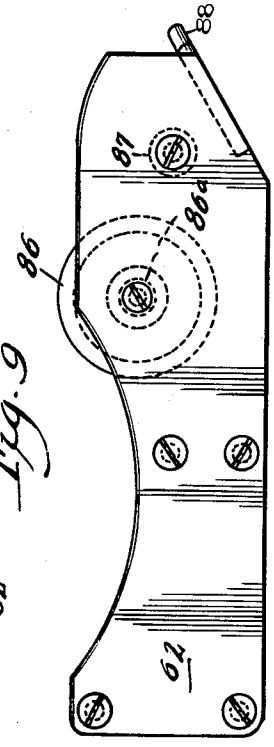

Fig. 9

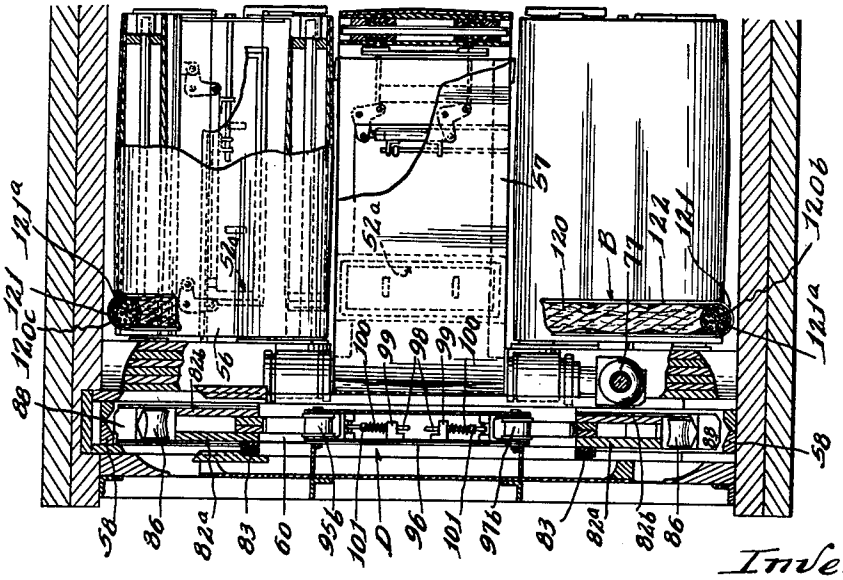

Fig. 4

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BALL AND PIN HANDLING MECHANISM

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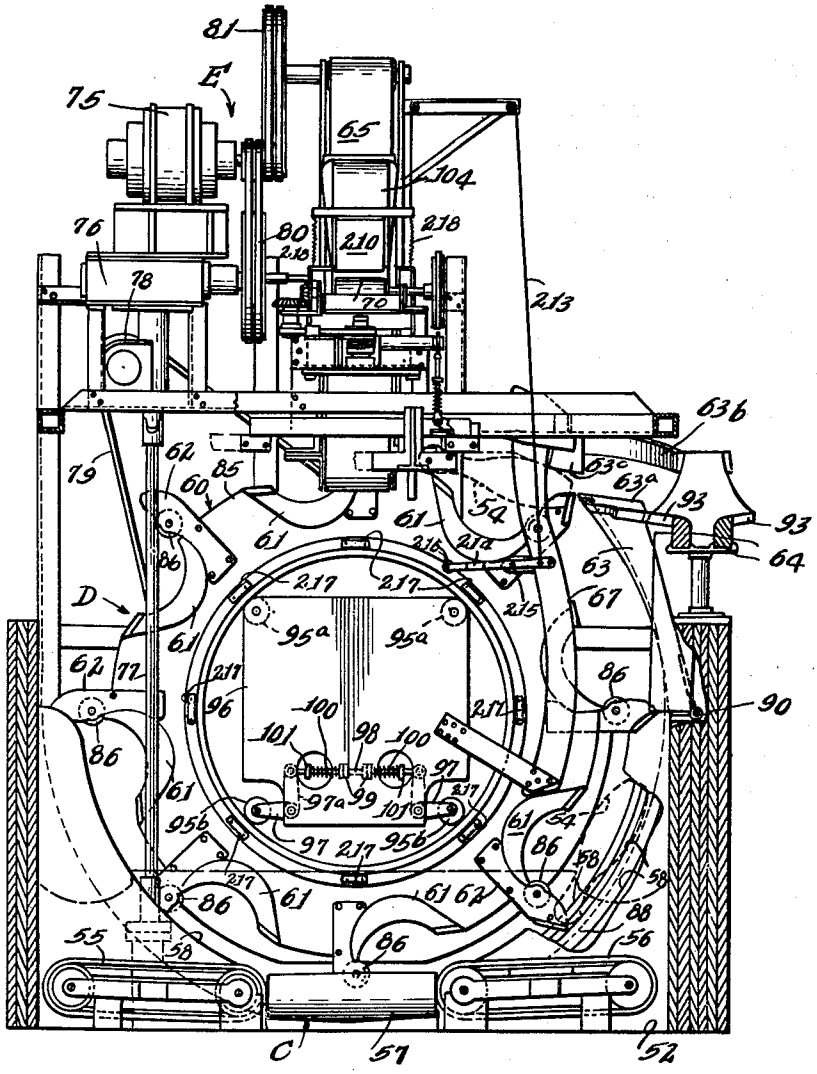
Fig. 5



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Nov. 22, 1960 — G. A. MONTOOTH — 2,961,237

BALL AND PIN HANDLING MECHANISM

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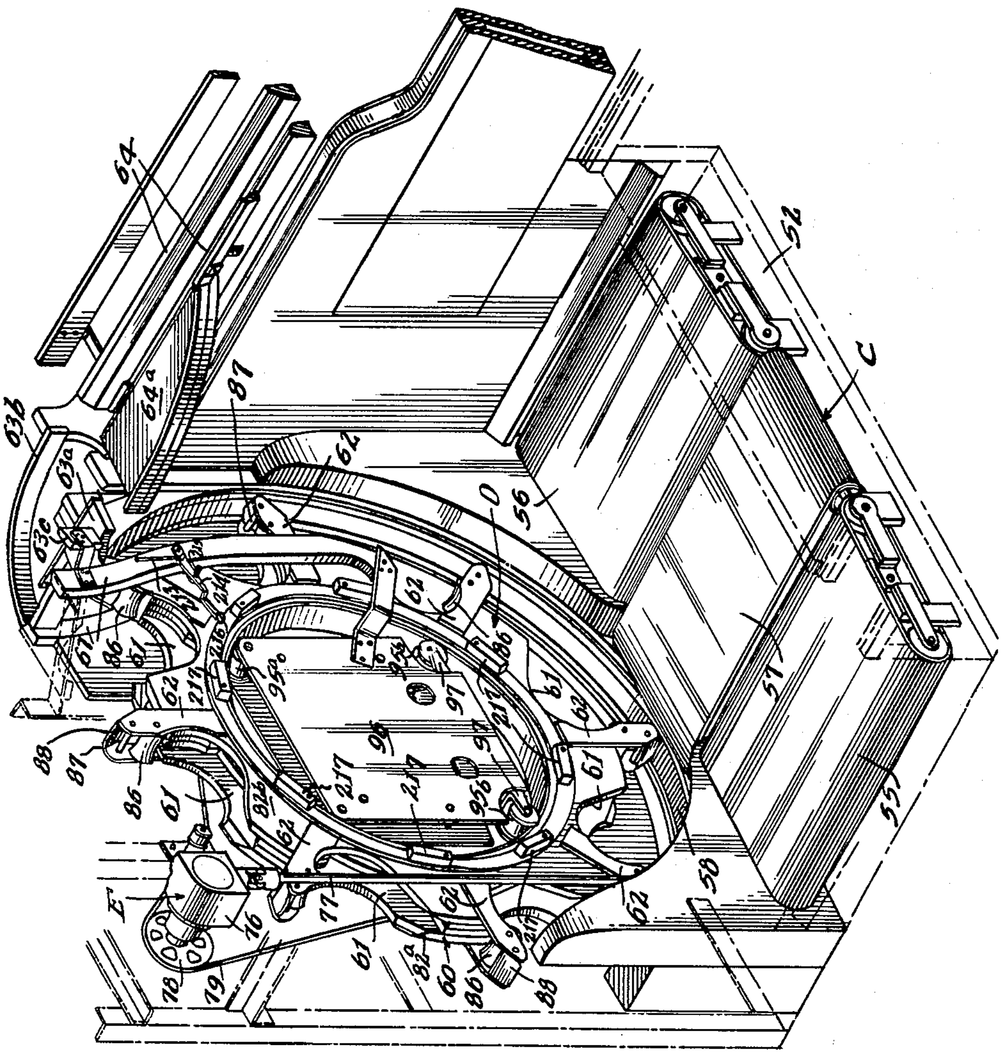

Fig. 6

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BALL AND PIN HANDLING MECHANISM

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Fig. 7

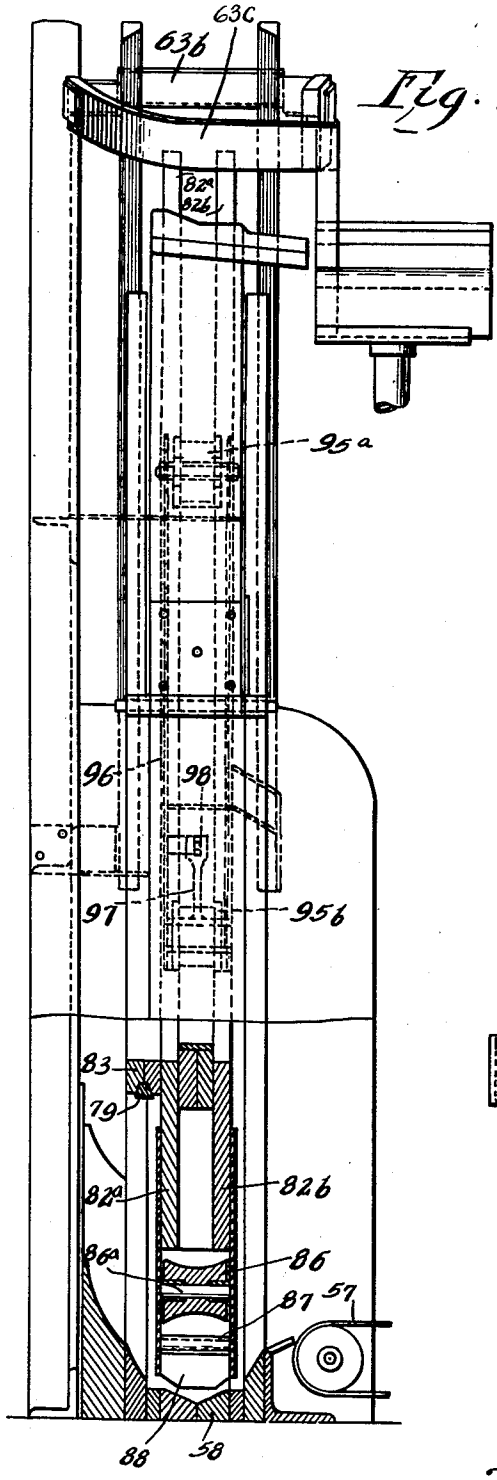
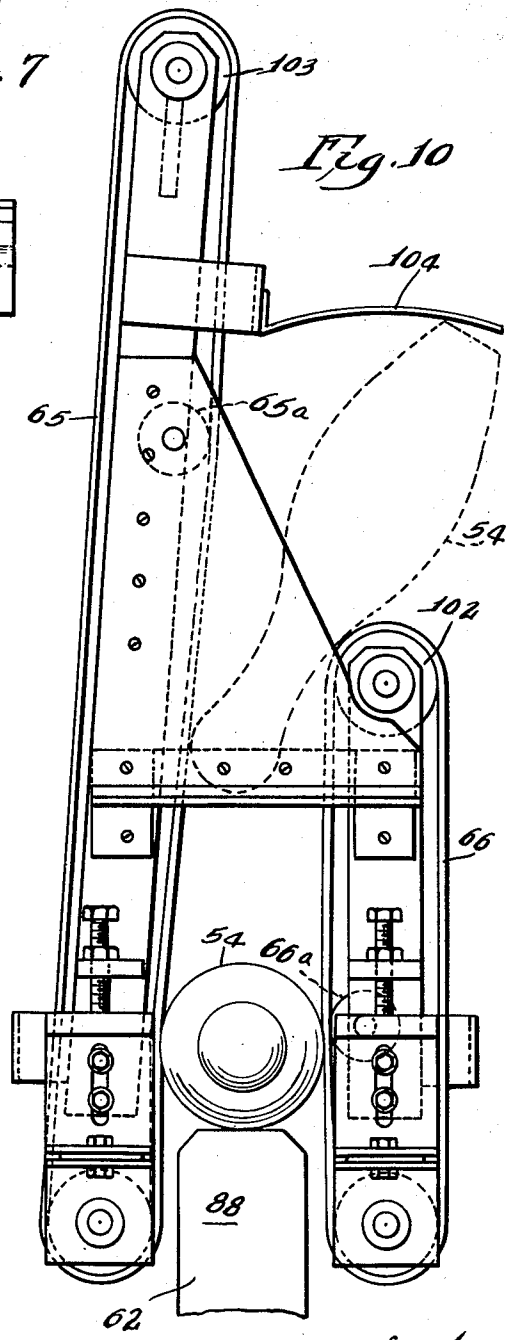


Fig. 10



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United States Patent Office 2,961,237 Patented Nov. 22, 1960

2,961,237

BALL AND PIN HANDLING MECHANISM

George A. Montooth, Long Beach, Calif., assignor to Brunswick Corporation, a corporation of Delaware

Original application Jan. 14, 1948, Ser. No. 2,205, now Patent No. 2,729,449, dated Jan. 3, 1956. Divided and this application May 18, 1955, Ser. No. 509,248

4 Claims. (Cl. 273—43)

This invention relates to a pin setting machine, and more particularly to a pin setting machine having novel ball and pin gathering means.

This application is a division of my application Serial No. 2,205, filed January 14, 1948, now Patent No. 2,729,499.

An object of this invention is to provide a new and improved pin setting machine for bowling alleys.

Another object is to provide a pin setting machine embodying new and improved means for gathering the ball and pins from the alley and pit and for elevating them to return the ball to the bowler and the pins to a position for resetting.

Another object is to provide in a pin setting machine for use with an alley bed having a pin deck and a pit at the rear thereof, ball and pin gathering apparatus comprising a movable pit cushion, means for moving said cushion out of the way to permit said ball and pins to pass thereunder and to the rear thereof, means for moving said ball and pins to the rear of said cushion, and means behind said cushion for elevating said ball and pins above said pit.

Another object of this invention is to provide ball and pin handling apparatus comprising a ball and pin carrying wheel located in the alley pit behind the movable pit cushion, said wheel being rotatable about an axis extending longitudinally of said pit and having around its periphery ball and pin engaging means, means for guiding said ball and pins into engagement with said wheel near the bottom thereof, a track for retaining said ball and pins in engagement with said wheel for a portion of a revolution of said wheel, means for causing said ball to be removed from said wheel without removing pins carried by said wheel, means for removing pins from adjacent the top of said wheel, and motor means for driving said wheel and said pin removing means.

Another object of this invention is to provide a ball and pin handling mechanism including a conveyor for transporting pins from an elevator to a magazine and releasable blocking means associated with said conveyor for causing equal spacing between pins carried along said conveyor so as to permit proper indexing of the magazine.

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 side view, partly in section and partly in elevation, of a pin setting machine constructed in accordance with my invention;

Fig. 2 is a plan view of the machine shown in Fig. 1;

Fig. 3 is a front elevation of the machine shown in Fig. 1;

Fig. 4 is a longitudinal section along the line 4—4 of Fig. 1 with part of the pit cushion and the pit conveyor broken away to shown underlying structure;

Fig. 5 is a transverse vertical section through the machine taken at the rear of the alley bed and looking

toward the rear of said machine, with the swinging pit cushion removed;

Fig. 6 is an isometric view of the pit with the swinging pit cushion and its associated structure removed;

Fig. 7 is an enlarged vertical section through the sorter wheel;

Fig. 8 is an enlarged plan, partly in section, of one of the ball and pin carrying paddles of the sorter wheel;

Fig. 9 is an elevational view of the paddle of Fig. 8; and,

Fig. 10 is an enlarged view of the vertical conveyors which remove pins from the sorter wheel.

While the invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a 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 embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, the machine illustrated is adapted for use on an alley bed **50**, the rear portion comprising a pin deck, said alley having conventional gutters **51** associated therewith and having at the rear thereof a conventional pit **52**. Said machine comprises various ball and pin gathering mechanisms including a sweep and guard mechanism designated generally at A; a movable pit cushion which is operatively connected with the sweep and guard mechanism and is designated generally at B; a conveyor system on the floor of said pit, this conveyor system being designated generally at C and being operative to move the ball and pins which have fallen from the pin deck into the pit to the rear of said pit cushion; and a ball and pin elevating system designated generally at D, this system including means for moving the ball and pins to an elevated position behind the cushion; means for removing said ball to a ball return track; means for elevating the pins and arranging said pins in a desired manner; and means above said pit for conveying the pins across the pit to a position above the pin deck.

Means for driving the mechanisms C and D are designated generally at E, this means also serving to provide power for indexing a rotary pin arranging magazine F to which pins are fed by the gathering means above set forth. From the magazine the pins are delivered to a pin setting mechanism G which is positioned directly above the pin deck of the alley bed **50** and is operable to descend through a pin pickup mechanism H to set pins on said deck. Power to operate the sweep and guard, pin setting and pin pickup mechanisms is derived from a power arrangement I comprising a motor, a transmission and other drive connections.

Inasmuch as the machine illustrated is described in the Montooth and Schlitt Patent No. 2,705,146, granted March 29, 1955, and the operation of certain of the machine mechanisms including the magazine F and the pin setting and pickup mechanisms G and H is described in detail in the application of George A. Montooth, filed March 24, 1947, as Serial No. 736,643, now Patent No. 2,817,529, the complete operation of the machine will be described only briefly here to show the general coordination of the ball and pin gathering means with the balance of the machine.

In Fig. 1 the machine is shown after it has completed a portion of its cycle after the rolling of a ball **53** which has knocked down some of the pins **54**, some of the fallen pins or deadwood remaining on the pin deck and some of the fallen pins having been knocked into the pit **52**. At the particular point in the cycle illustrated the sweep and guard A have been lowered to their operative

position, the swinging pit cushion B has been elevated to permit the passage of the ball and pins therebeneath, and the pickup mechanism H has descended and is about to pick up the standing pins so that the alley bed may be swept clear of deadwood. The cycle of operation of the machine may have been initiated in any one of a number of ways, as for example by placing one or more light beams in the path of said ball so that interruption of said light beams by the ball causes actuation of a switch to start the cycle of operation; or, preferably, in the particular machine illustrated, the cycle of operation may have been initiated by the weight of the ball in the pit, one or more switch panels **52***a* being positioned in the pit and being operated by the weight of the ball on the conveyor C to start a cycle of operation. In any event, once started, the machine is designed to continue its cycle of operation to pick up the standing pins, sweep the deadwood from the alley, replace the standing pins thereon, return the ball **53** to the player's end of the alley, and gather the pins from the pit preparatory to placing a new set of pins on the pin deck. After a second ball is rolled the alley is swept and a new set of pins are placed in position on the pin deck. In the event the first ball has knocked down all of the pins the pickup operation is dispensed with and the alley is swept and a new set of pins are placed in position. Should the first ball miss the pins, as by rolling down the gutter, the pins are left on the alley in readiness for the second ball. The operation of the machine through its various cycles is described in detail in the Patent No. 2,705,146, above referred to.

The conveyor system C on the floor of the pit comprises a pair of endless belts **55** and **56** (see Figs. 5 and 6) extending from opposite sides of said pit and running toward the center thereof, and a third endless belt **57** extending longitudinally of said pit in the center thereof and running toward the rear of said pit. Preferably these belts are tiltable to permit access to the pit floor beneath them. The two transverse belts **55** and **56** deliver the ball and pins to the center belt **57**, and said center belt carries the ball and pins beneath the swinging pit cushion B and to the rear of the pit. At the rear of the pit the ball and pins are guided by the belt **57** onto an arcuate wooden track designated at **58** and best shown in Fig. 6. This wooden track is shaped to allow either a ball or pin to enter and acts to guide the ball and pins into engagement with a rotatable conveyor and sorter wheel **60** which is rotatable about an axis extending longitudinally of said pit, said wheel having a diameter only slightly less than the width of said pit and having about its periphery a plurality of recesses **61** and a plurality of paddle members **62** for engaging said ball and pins. As shown in Fig. 6 the track **58** is curved to be concentric with the wheel, and as the wheel rotates in a counterclockwise direction (as the parts appear in Fig. 6) the ball is picked up in one of the recesses **61**, and the pins are picked up one by one by engagement with the paddle members **62** and are elevated above the pit.

Means are provided for causing said ball to be removed from said wheel after a portion of a cycle of rotation of said wheel without removing the pins carried by the wheel, this means comprising a ball roll-off track **67** and a pivotal extension **63** of the track **58**. This extension is pivoted at **90** (Fig. 5) and is pushed outwardly (to the right in Fig. 5) as the ball moves up along the roll-off track **67**, and the extension **63** falls back beneath the ball, a horizontal portion **63***a* providing a support for the ball as it rolls from the track **67** over a sloping platform **64***a* and onto a ball return track **64** which carries it back to the player's end of the alley. Guide members **63***b* and **63***c* prevent the ball from falling back into the pit as it moves from the sorter wheel to the return track **64**.

The two rails of the track **67** are spaced apart a distance greater than the width of a pin and less than the diameter of a ball to allow the pins to pass between said rails, while the ball is carried up by said rails. The pins are carried to a position adjacent the top of the wheel where they are engaged between two vertically traveling belts **65** and **66** (Fig. 10) and are elevated to a further point above the alley and delivered butt end first to a transverse or crossover conveyor comprising an endless belt **70**. This belt carries the pins to a position above the alley bed and deposits them in the rotary magazine F. When the magazine F is loaded with a full complement of 10 pins and when the pin setting mechanism G is empty and is in a position to receive pins, the pins are delivered from the magazine F to the pin setting mechanism, and at the completion of a bowling frame the pin setting mechanism is lowered down through the pickup structure and sets a new group of pins on the pin deck.

Rotary sorter

The rotary sorter wheel is shown in Figs. 1, 5 and 6. The sorter is driven by an electric motor **75**, this motor providing power for the pit floor conveyor C, the rotary sorter **60**, the upending belts **65** and **66**, the crossover belt **70**, and an indexing mechanism for the magazine F. A transmission assembly **76** transmits power to the pit floor conveyor through shafting **77**, and power from the transmission assembly is delivered to the rotary conveyor through a pulley **78** and a belt **79**. The main shafting of the transmission assembly **76**, which is driven by a pulley **80**, is connected with the crossover belt **70** which in turn connects with the indexing mechanism for the magazine F, and another pulley **81** drives the vertical belts **65** and **66**. In the operation of the machine the motor **75** and the mechanisms driven thereby operate continuously.

The rotary sorter comprises a wheel rim made up of two side panels **82***a* and **82***b*, these panels being spaced apart about one and one-half inches so that as the pins are carried around to the top of the wheel they can lie on the rim, being supported by said panels. The belt **79** is trained about a pulley **83** which is shown in cross section in Figs. 1 and 4, said pulley being secured to the side panel **82***a* to cause the wheel to rotate. As shown best in Figs. 5 and 6, there are **8** recesses **61** in the outer edge of the wheel rim to provide pockets to carry the ball, and at the rear or trailing edge of each recess a paddle member **62** extends radially outward from said rim. As the wheel rotates (counterclockwise in Figs. 5 and 6) the ball is engaged in one of the recesses and the pins are engaged by the paddle members adjacent other recesses, and the ball and pins are elevated above the pit, being held in engagement with the wheel by the track **58**.

To elevate the ball to its return track without sliding it between the wheel and the track **58**, each of the paddle members **62** is provided with a roller **86** supported between the opposite side members of the paddle on an axle pin **86***a*. Only one pin or one ball can be held by each of the paddles and recesses, and consequently, as the wheel rotates, the pins are spread out or "de-bunched" and the ball is separated from the pins.

Figs. 8 and 9 show the details of the preferred paddle construction. As pointed out earlier, the roller **86** carries the ball and allows it to roll rather than slide along between the wheel and the track **58**. The surface of the roller is concave as shown in Fig. 8 to prevent the ball from rolling off. A cross bar **87** extends between the opposite walls of each paddle and is positioned to engage the butt end of a pin in the event the pin is picked up by the wheel in such position, and a member **88** extends outwardly beyond the outer end of the paddle walls in position to engage the head end of the pin should the pin be picked up with its butt end facing in the direction of rotation of the wheel.

As the rotation of the sorter wheel carries the pins upwardly around the track **58**, said pins, being smaller in diameter than the ball, are carried between the ball

roll-off tracks 67 and up to a position adjacent the top of the wheel where they are engaged by the belts 65 and 66 and lifted off the wheel. The ball is rolled along the track 58 until it is engaged by the members 67 which are located one on each side of the wheel and spaced far enough apart so that the pins can pass freely between them but the ball cannot. As the ball continues upward, the pivoted member 63 is moved back, and as the ball is elevated above the level of this member, the member falls back under the ball, the portion 63*a* of the member 63 providing a rolling surface along which the ball rolls guided by rails 63*b* and 63*c* to the ball return track 64. A sloping board is provided on each side of the return track 64 so that if two balls are returned to the track simultaneously by pin setting machines in adjacent alleys the balls will be prevented from jamming in the track. One of these boards 64*a* is shown in Fig. 6.

Preferably the rotary conveyor 60 is made in right and left-hand models so that the machines can be installed in pairs on adjacent alleys, the two conveyors delivering the ball to the same return track and thus permitting the use of one common ball return track without necessitating changes in any other part of the machine. The rotary conveyor 60 is internally supported by means of an upper pair of rollers 95*a* and a lower pair of rollers 95*b*, both pairs of rollers being mounted on a bracket 96 which is attached to the machine frame. The upper rollers 95*a* are stationary with respect to the bracket 96, while the two lower rollers 95*b* are each mounted on a yoke 97, each yoke having a right angular extension 97*a*. Each yoke is pivotally jointed to the bracket 96 and the end of each extension 97*a* is pivotally connected to a guide pin 98. The guide pins are slidable in brackets 99 which are fixedly mounted on the bracket 96, and a compression spring 100 surrounds each guide pin 98, each spring abutting at one end against one of the brackets 99, and abutting at the other end against a collar 101 carried by the guide pin. By this means the two lower rollers 95*b* are spring loaded and maintain a constant pressure on the wheel rim, thus preventing misalignment of the wheel.

Vertical pin elevator

The vertical pin elevator comprises the two spaced belts 65 and 66 as shown in Fig. 10. These belts extend downwardly to a point opposite the top of the rotary conveyor 60 and are spaced apart a distance less than the widest diameter of a bowling pin. The shorter belt 66 is trained over a pulley 102 which is driven clockwise as the parts appear in Fig. 10, and the belt 65 is trained over a pulley 103, this pulley being driven counterclockwise. Thus, the inner run of the two belts travels upwardly and as the rotary conveyor 60 carries a pin between these belts, the pin is gripped and lifted from the wheel and carried up between the two belts. A roller 66*a* within the belt 66 assists the belt in obtaining a firm grip on the pin, and a roller 65*a* within the belt 65 assists in discharging the pin. Obviously, since the pin is grasped by the belts only at the largest point or belly of the pin and this point is below the center of gravity of the pin, the pin hangs upside down as it travels upwardly between the belts. When the bowling pin passes the pulley 102, it is diverted by a hood 104 and the pin is caused to fall onto the transverse or crossover belt 70, the butt end of the pin leading. The crossover belt 70 carries the pins across the pit to a position above the rear of the pin deck and delivers the pins to the rotary magazine F.

It sometimes happens that pins are spaced too closely together to allow the rotary magazine F time to complete its required indexing operation so that the magazine is not ready to receive the next pin when it is delivered by the crossover belt 70. This condition occurs when the rotary sorter wheel delivers consecutive pins to the vertical pin elevator, with their butt ends in opposite directions. A pin which is delivered butt end first will be lifted from the sorter wheel quicker than one delivered top end first; therefore the even spacing attained by the rotary sorter wheel is lost as the pins are lifted from the top of the wheel. In order to correct this situation I provide a shutter which is operable to space the pins the required distance apart as the pins leave the hood 104 to travel along the crossover belt 70 so that the magazine F has sufficient time between the arrival of successive pins to complete its indexing operation.

A shutter 210 is mounted on the hood 104, said shutter extending across and blocking the exit opening of said hood and being pivotal to an out of the way position. The shutter has a pair of rearwardly-extending oppositely-disposed lever arms 211 (see Fig. 1) which are pivoted on the hood at 212, one of these arms being secured to a cable 213 which passes over idler sheaves and is secured to one end of an actuating arm 214 (Figs. 5 and 6). The arm 214 is pivoted on a stationary part of the machine, Figs. 5 and 6 showing the arm 214 being pivotally mounted intermediate its ends on a pin 215 on a bracket extending from one rail of the ball guiding track 67. The other end of the arm 214 terminates adjacent the sorter wheel 60 and carries a cam roller 216 which is adapted to engage a plurality of cam blocks 217 equally spaced around the periphery of the sorter wheel 60.

As the wheel 60 rotates, the cam blocks 217 successively engage the roller 216, causing the arm 214 to pivot about the pin 215 and pull on the cable 213. This raises the shutter 210 away from the hood exit opening and allows a pin to pass from the hood 104. When the cam block 217 passes the roller 216, the cable slacks and springs 218 return the shutter 210 to blocking position in front of the hood exit opening where it is in position to block a pin from leaving the hood until the roller 216 contacts the next cam block.

Swinging pit cushion

As appears in the earlier part of this description, the swinging pit cushion B is mounted for vertical movement, said cushion normally extending substantially entirely across the pit in the path of the ball and pins on the conveyor C, and being elevated in operation a sufficient distance to allow the ball and pins to pass therebeneath.

The cushion is shown in cross section in Figs. 1 and 4. Said cushion comprises a generally rectangular body portion 120 having a bottom 120*a*, two opposite sides 120*b* and 120*c*, and a top 120*d*. The body portion is firmly packed with stuffing material and a resilient tube 121 is secured to the body portion, said tube extending in one piece around the edges of the two opposite sides and the bottom of the body portion and extending in a separate piece across the top of the body portion. In order to give the cushion weight, that portion of the tube which extends across the bottom of the body portion and part way up each side is filled with suitable heavy material, as for example shot designated at 121*a*. The entire unit is enclosed in a fabric casing 122, and this casing has a flap 122*a* extending from the top thereof for suspending the cushion for vertical movement. As shown in Fig. 1, the flap 122*a* is secured to a roller 123. This roller is non-rotatably mounted on a shaft 123*a* which has a pair of gears 123*b* pinned thereto, said gears being adapted to be driven by a pair of racks 124 located on opposite sides of the alley. The racks are carried in brackets 125 mounted on the frame of the machine, these brackets being slotted at 125*a* for the reception of the ends of the shaft 123*a*. Adjacent each of the brackets 125 a collar 126 (see Fig. 2) is rotatably mounted on the shaft 123*a*, and to each of these collars is affixed on end of one of the cables 127 and 127*a*. As shown in Fig. 1, each of these cables is trained over a sheave 128 and the other end of the cable is secured to one of the raising and lowering arms of the guard. Consequently, when the guard is lowered after each ball is rolled, the cables

127 and 127*a* are pulled, causing the gears 123*b* to move forwardly along the racks 124, turning the shaft 123*a* and winding the flap 122*a* on the roller 123 so that the cushion is elevated to permit the ball and pins to pass therebeneath. At the end of the sweeping operation when the guard and sweep are raised to their inoperative position, the weight of the cushion causes the flap 122*a* to unwind from the roller 123 so that the cushion is lowered and the gears 123*b* move to the rear end of the racks 124. This mechanism not only insures the raising of the cushion after the rolling of each ball, but also results in a construction wherein the cushion and the guard-sweep mechanism act as counterweights for each other.

Sweep and guard

As appears from the early portion of this description, the sweep and guard are normally carried in a rest position above the alley bed, and after the rolling of each ball the sweep and guard are lowered to the alley bed as shown in Fig. 1 and at the proper time the sweep is moved rearwardly to the rear of the alley bed, sweeping pins into the pit. Power for these operations is derived from a motor 140 and a transmission mechanism 141 which includes means for reducing the drive speed, as for example from 1750 r.p.m. to 175 r.p.m. The transmission mechanism includes a double acting clutch which is operated by two solenoids 220 and 221. This arrangement provides up and down motion for the guard and sweep and horizontal rearward and forward motion for the sweep, power to drive the guard and sweep being delievered from the gear mechanism 141 to the sweep by means of a chain 142.

The chain engages a sprocket 143 carried by a gear case 144. Inside the gear case is a planetary gear assembly which is fully described in the parent application, Serial No. 2,205, now Patent No. 2,729,449, and which drives either racks 153 or chains 158 for raising and lowering the guard and sweep and moving the sweep along the alley as fully described in said parent application.

The sweep and guard assembly are shown in Fig. 1. The sweep comprises a board 160 which is supported transversely across the alley by a pair of vertical arms 161 on opposite sides of the alley. At their upper ends the arms 161 are pivotally and slidably attached to roller brackets 162, this connection being made by means of a pivot pin 162*a* mounted on each bracket and extending through a slot 161*a* in each of the arms 161. These arms are pivotally and slidably connected to the roller brackets 162 in order to allow the sweep to pivot and stop its downward movement in the event the sweep should come down on top of a pin lying on the alley or in the gutter, and thereby prevent a jam which might cause damage to the machine. The sweep is prevented from pivoting toward the player's end of the alley by a lug 162*b* formed on the bracket 162.

The roller brackets 162 engage a movable track 163 by means of rollers (not shown).

The guard consists of a padded member 185 which is supported transversely across the alley by pivoted arms 186 on opposite sides of the alley, these arm being pivotally attached at their rear ends to a stationary part of the machine. As shown in Fig. 3, there are sockets 187 in each of the gutters. These sockets engage and hold the lower ends of the arms 186 and thus absorb part of the shock caused by the impact of a ball against the guard. By this construction it is possible to build this portion of the machine of lighter material and still provide strength enough to withstand the great shock developed at the impact of a fast-rolling 16-pound ball. Near the front end of each of the arms 186 there is a joint comprising a pivot connection 188 and a partially cut out sleeve 189, this connection allowing the lower end of the arms 186 to pivot upwardly only, thereby preventing a jam in the machine in the event a pin rests under the guard as it is lowered to the alley.

At an intermediate point along the arms 186 the racks 153 are attached by means of brackets 191. At a point slightly above the bracket 191, a roller 192 is attached to each rack 153, this roller engaging the sweep track 163 to lift the sweep track to its tilted upper position so that as the rack 153 is driven up and down, the guard and sweep are raised and lowered and the entire sweep track pivots to a rest position. The cables 127 and 127*a* which operate the pit cushion B are respectively secured to the cable clevis (not shown) which is mounted on each of the arms 186 to the rear of the bracket 191. This interconnection between the guard-sweep and the pit cushion allows each of these mechanisms to act as a counterbalance for the other.

I claim:

1. Bowling ball and pin gathering apparatus for use with an alley bed having a pit at the rear thereof and a swinging pit cushion in said pit, comprising, a ball and pin carrying wheel located in said pit behind said cushion, said wheel having a diameter only slightly less than the width of said pit, being rotatable in a vertical plane about an axis extending longitudinally of said pit and having about its periphery a plurality of ball engaging recesses, a plurality of ball and pin engaging paddle members carried by said wheel adjacent said recesses, means for guiding said ball and pins into engagement with the said wheel near the bottom thereof, a track for retaining said ball and pins in engagement with said wheel for a portion of a cycle of rotation of said wheel, a roller carried by each paddle member for preventing sliding contact of said ball with the track, a pair of spaced track members adapted to be engaged only by said ball and a pivoted member adapted to be pivoted only by said ball for causing said ball to be removed from said wheel without removing pins carried by said wheel, a first conveyor comprising a pair of endless belts spaced apart a distance less than the greatest diameter of a pin for removing pins from adjacent the top of said wheel and elevating said pins above said wheel, a second conveyor extending from adjacent said first conveyor to above said alley bed for carrying pins forwardly across said pit, means for spacing pins on said second conveyor, and motor means for driving said wheel and said conveyors.

2. Bowling ball and pin gathering apparatus for use with an alley bed having a pit at the rear thereof and a swinging pit cushion in said pit, comprising, a ball and pin carrying wheel located in said pit behind said cushion, said wheel having a diameter only slightly less than the width of said pit, being rotatable in a vertical plane about an axis extending longitudinally of said pit and having about its periphery a plurality of ball engaging recesses, a plurality of ball and pin engaging paddle members carried by said wheel adjacent said recesses, means for guiding said ball and pins into engagement with said wheel near the bottom thereof, a track for retaining said ball and pins in engagement with said wheel for a portion of a cycle of rotation of said wheel, a pair of spaced track members adapted to be engaged only by said ball for causing said ball to be removed from said wheel without removing pins carried by said wheel, a conveyor comprising a pair of endless belts spaced apart a distance slightly less than the greatest diameter of a pin for removing pins from adjacent the top of said wheel, and motor means for driving said wheel and said conveyor.

3. Apparatus of the character defined in claim 2, wherein said paddle members each carry a roller for preventing sliding contact between said ball and said wheel and track.

4. Apparatus for removing bowling pins from the pit of a bowling alley and elevating them to a pin discharge station, comprising a U-shaped pin receiving channel having a cross sectional width and depth approximating the largest diameter of a bowling pin extending along

one side of and at substantially the same level as said pit, means for moving bowling pins from the floor of the pit along a substantially horizontal plane directly into said U-shaped channel, and a plurality of spaced pin engaging flights moving in a closed path the lower run of which travels along said U-shaped channel to forward pins lengthwise along said channel, said flights being operative to advance bowling pins to said pin discharge station.

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