Jan. 27, 1953 A. M. SIMPSON 2,626,802

BOWLING PIN CONVEYING AND ORIENTING MECHANISM

Filed Feb. 7, 1947 4 Sheets-Sheet 1

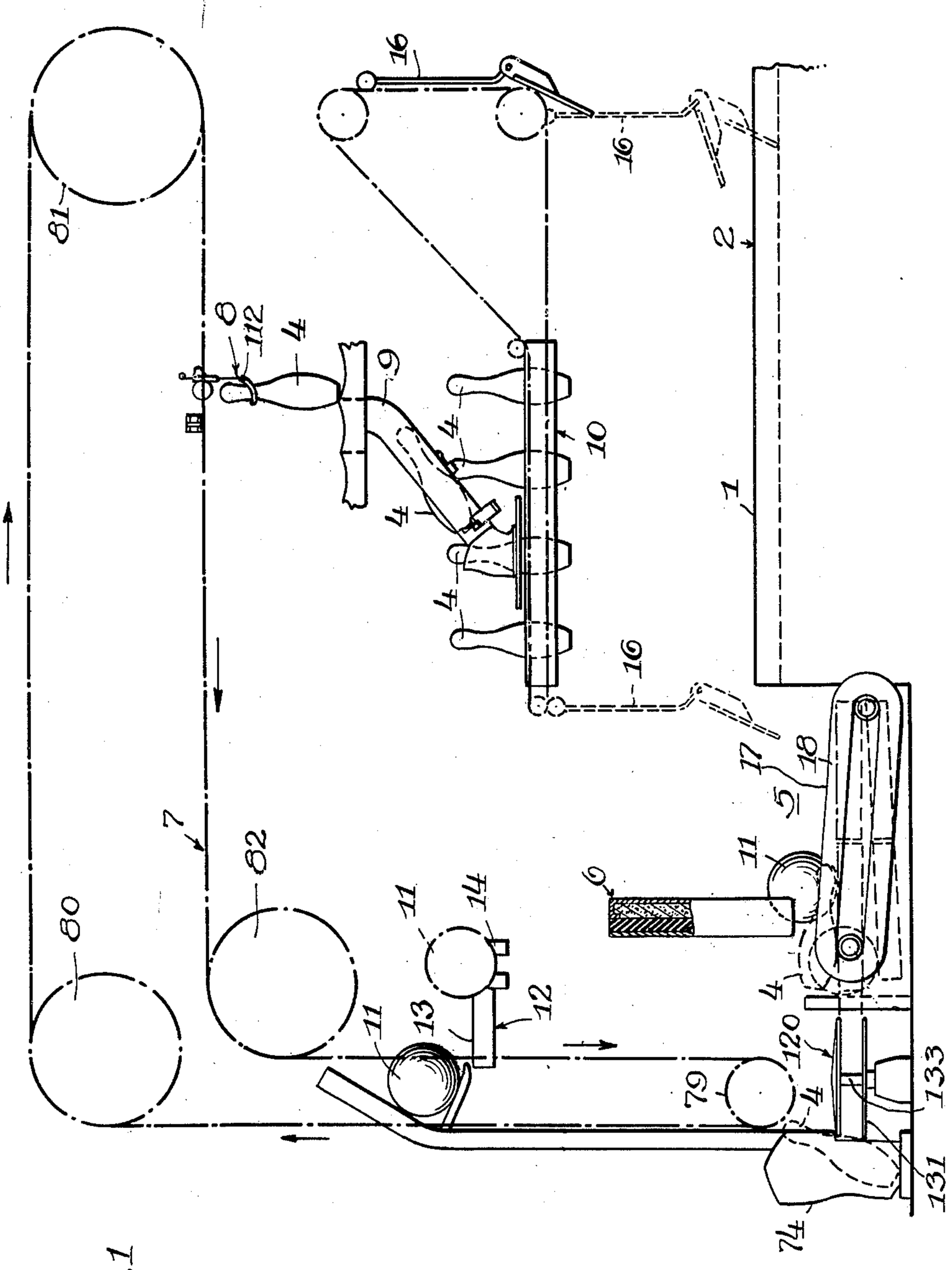

Fig. 1

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Filed Feb. 7, 1947 4 Sheets-Sheet 2

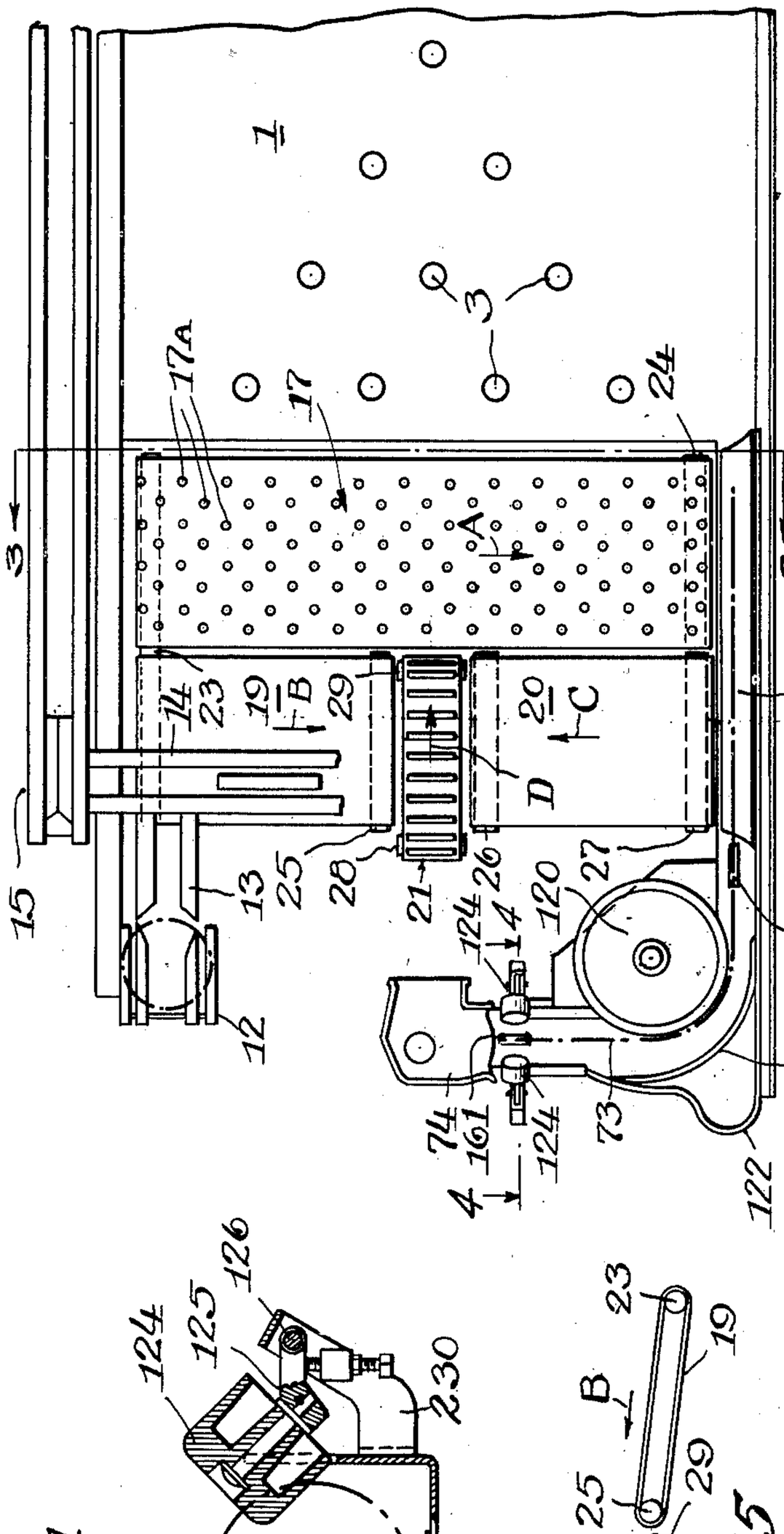

Fig. 2

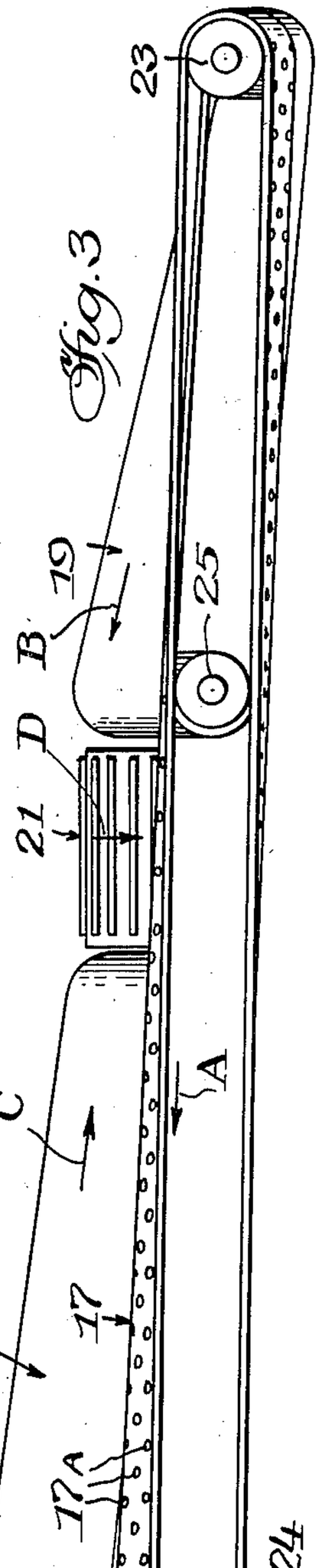

Fig. 3

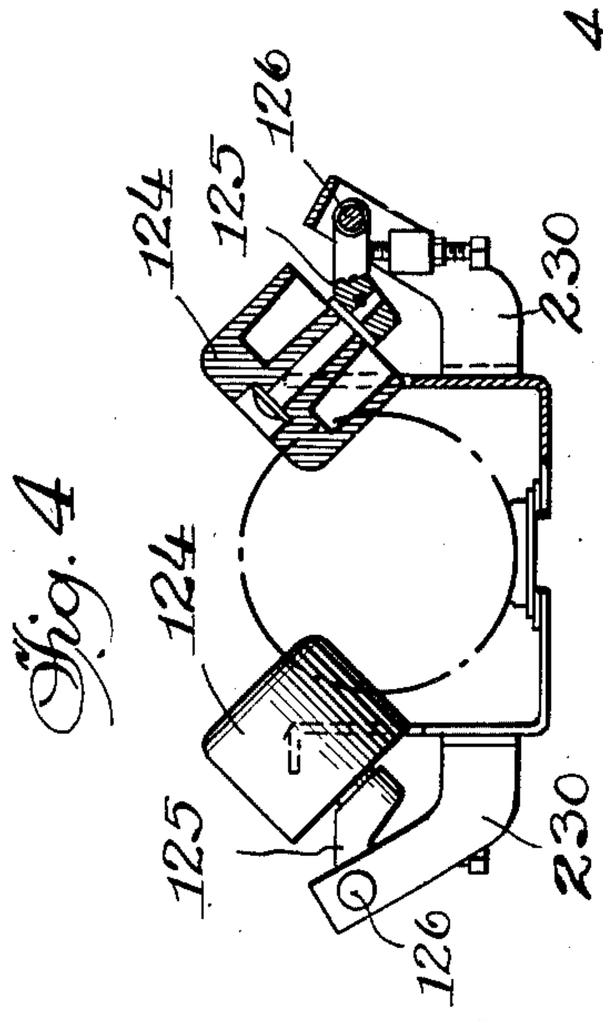

Fig. 4

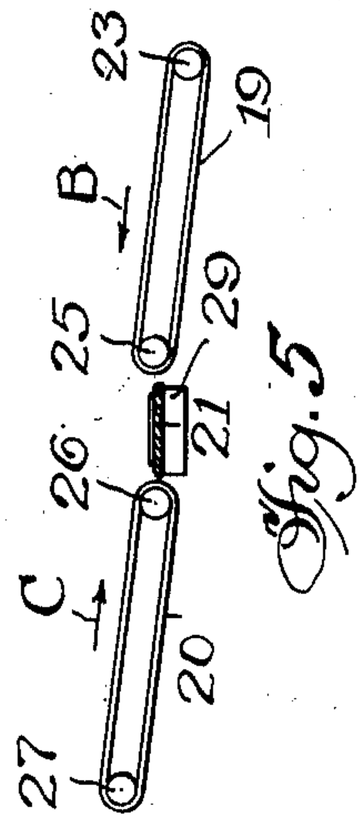

Fig. 5

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BOWLING PIN CONVEYING AND ORIENTING MECHANISM

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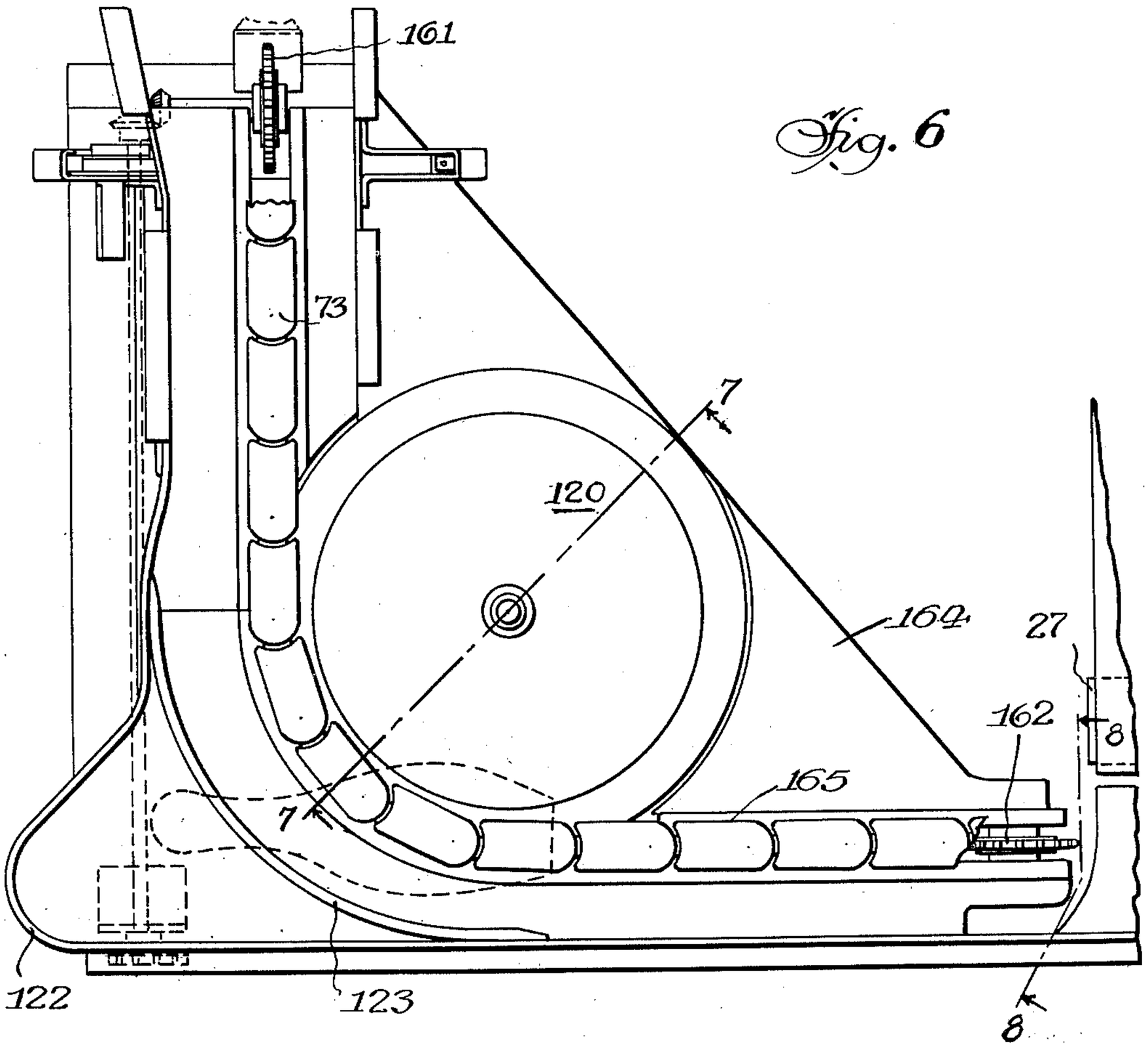

Fig. 6

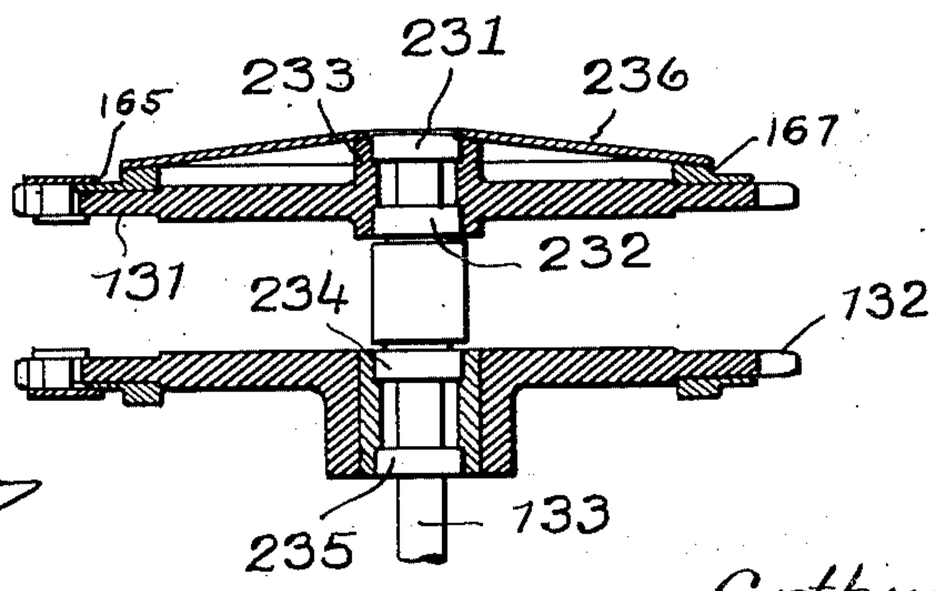

Fig. 7

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BOWLING PIN CONVEYING AND ORIENTING MECHANISM

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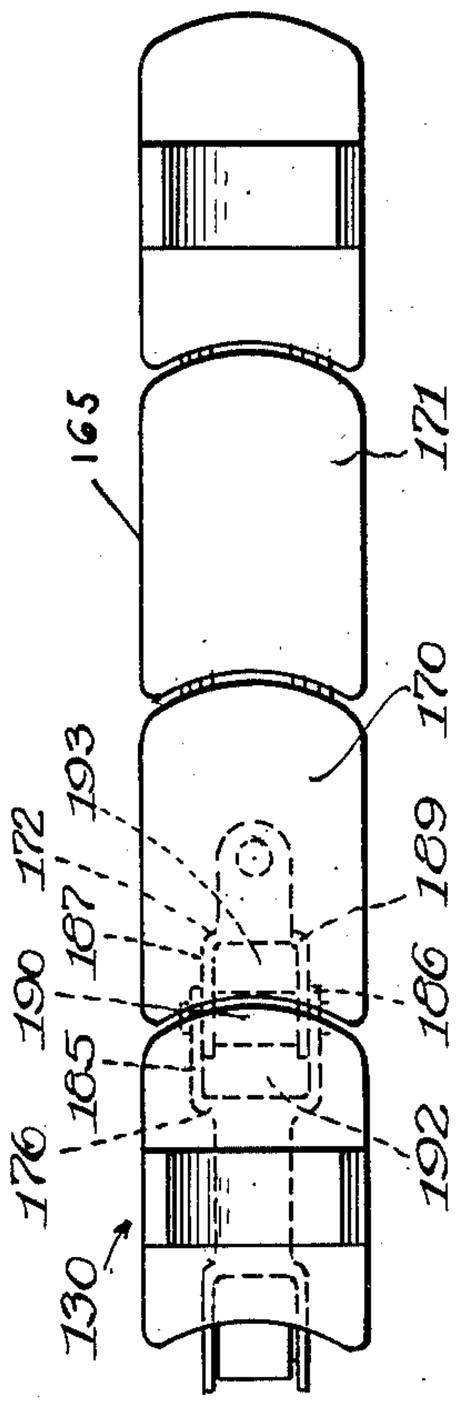

Fig. 9

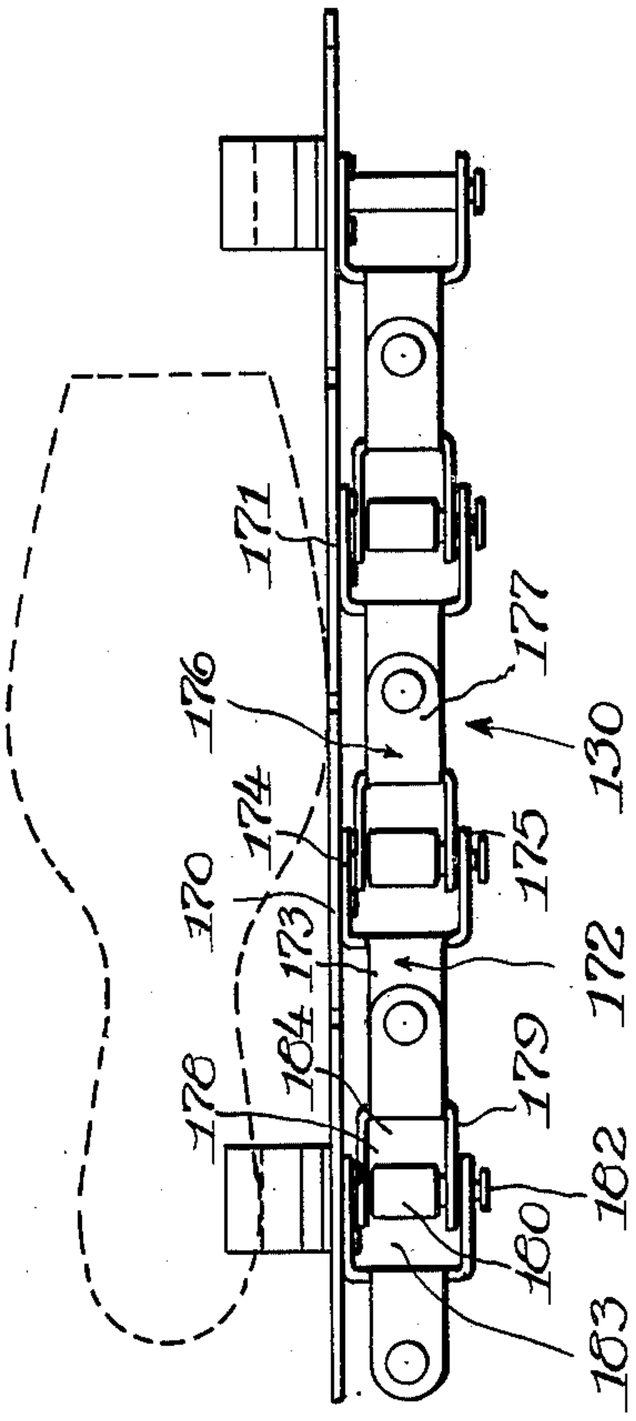

Fig. 10

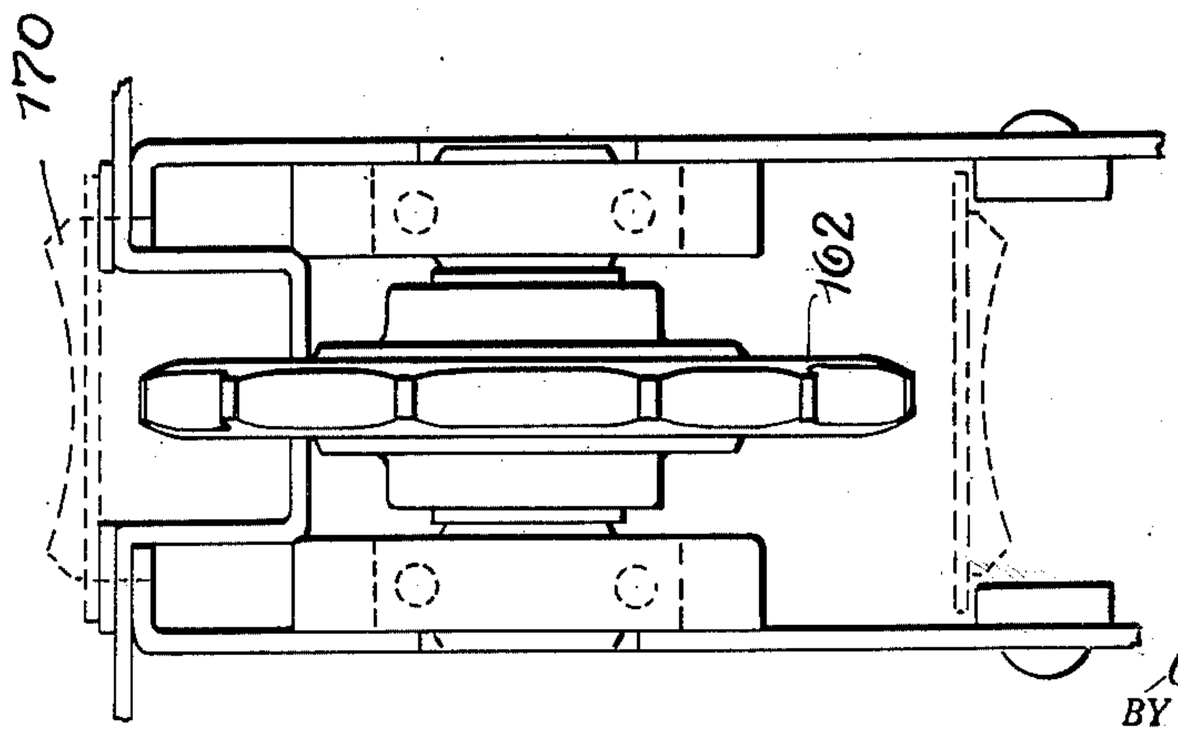

Fig. 8

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UNITED STATES PATENT OFFICE

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BOWLING PIN CONVEYING AND ORIENTING MECHANISM

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Application February 7, 1947, Serial No. 727,209

3 Claims. (Cl. 273—43)

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The present invention relates to mechanism for bowling alleys and especially to such mechanism for use in standard or commercial forms of bowling alleys by which the manual clearing, setting and resetting of the pins and all manual operations now required in connection therewith are dispensed with and the various operations are automatically accomplished.

The present invention is a continuation in part of my copending application, Serial No. 663,018, filed April 18, 1946, now Patent No. 2,531,167, issued November 21, 1950.

The primary object of the present invention is to provide improvements in the means and mechanism for automatically orienting the pins and delivering them to the pin setter.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

The invention further resides in the construction, combination and arrangement of parts illustrated in the accompanying drawings, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other details, arrangements of parts, features and constructions without departing from the spirit of the invention.

In the drawings:

Fig. 1 is a diagrammatic view in side elevation of the complete assembly;

Fig. 2 is a plan view of the rear end of a bowling alley and showing the novel arrangement of the transverse belts in the pit for automatically separating and delivering the thrown ball and fallen pins collected in the pit after the ball has been delivered;

Fig. 3 is a front elevational view of the novel arrangement of pit belts, the view being taken in a plane represented by the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2, looking in the direction of the arrows;

Fig. 5 is a front elevational view showing the relative levels of the three pit belts;

Fig. 6 is a top plan view showing the details of the mechanism of conveyor 73;

Fig. 7 is a sectional view taken on line 7—7 of Fig. 6 showing the detail construction of the rotating disk 120;

Fig. 8 is a sectional view taken on line 8—8 of Fig. 6;

Fig. 9 is a top plan view of a chain suitable for use in the rear pin conveyor; and

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Fig. 10 is a side view of that chain.

Referring more particularly to the novel embodiment shown in the drawings, the present invention relates to mechanism disposed adjacent the pit end of a bowling alley for automatically accomplishing the operations previously accomplished by a pin boy in the pit, and especially to mechanism disposed in the pit and associated therewith for collecting the fallen pins and thrown ball, separating the ball from the pins, and separately delivering the ball to the front of the alley and the pins to an automatically operated setting mechanism for setting the pins in a manner similar to that manually performed by the pin boy.

As shown in Figs. 1 and 2, the rear end 1 of the bowling alley 2 is provided with locating spots 3 upon which the pins 4 are placed. At the rear of the alley is provided the pit 5 for receiving the fallen pins and ball and suitably mounted toward the rear of the pit is a cushion 6 suspended above the bottom of the pit. The pins are separated from the ball by a mechanism illustrated in Figs. 2 and 3 and hereinafter described in detail. The separated pins are then delivered through a suitable arrangement of conveyors to a pin hoist 7 having a plurality of spaced depending hooks 8 which carry the pins upwardly and then over the rear end of the alley and automatically drop these pins into spaced chutes 9 upon the actuation of suitable electrically and automatically controlled tripping mechanism, the chutes leading to a pin setter 10 which is vertically movable into and out of pin setting position. Although one chute is illustrated in Fig. 1 it will be understood that the pin setter includes ten setting cups, each of which is located at the lower end of its respective chute, so that there are ten chutes in all. Such chutes are per se well known to those skilled in this art so that further description thereof is deemed unnecessary.

The ball 11 is delivered to the side of the pit opposite to that of the pins where it is received upon a ball hoist 12 which elevates the ball and discharges it upon an inclined support 13 connecting with a transverse runway or ball return 14 leading to a return runway 15 extending longitudinally of the alley whereby the ball is returned to the front of the alley to the bowler. Suitably mounted at the rear of the alley is a pin sweep 16 which sweeps the alley clear of pins.

In describing the arrangement of the belts or other conveying mechanism, the terms "right" and "left" are used when looking toward the

rear of the alley from the position of the bowler at the front.

In Figs. 2 and 3 is shown the novel arrangement of pit conveyors comprising a transverse conveyor belt 17 moving in the direction of the arrow A for delivering the pins to the pin conveyor 18 disposed longitudinally of the alley and along one side of the pit 5. Conveyor belt 17 is provided with projections or knobs 17A which permit the ball to roll over them but which assist in catching the pins and prevent slippage. Associated with the pit conveyor 17 are transverse pit conveyors 19 and 20 and an intermediate pit conveyor 21, with the pit conveyors 19 and 20 moving in the directions of the arrows B and C, respectively, while the longitudinally extending intermediate pit conveyor 21 moves in the direction of the arrow D. To assure separation of the ball from the pins in the pit and the delivery therefrom of the ball and pins to their proper position for discharge or removal from the pit, the belts are inclined in such manner that the transverse pit conveyor 17 which extends completely across the pit is pitched forwardly at the left side thereof and rearwardly at the right side thereof so that although this conveyor is moving in the direction of the arrow A to carry the pins in that direction, the ball will automatically roll toward the rear and to the right of this conveyor (Fig. 3) and pass thereat onto the pit conveyor 19. As clearly shown in Fig. 1, the ball is restrained from forward movement by the rear portion of the alley 1. As shown in Fig. 3, the front end of roller 24 is at a greater height than the front end of roller 25, which in turn is at a greater height than the front end of roller 23. Therefore the ball rolls to the right even when it falls on the forwardly pitched portion of conveyor 17.

The pit conveyor belt 19 is pitched downwardly away from its direction of travel with its rear right end corner disposed at a lower elevation than the forward right end corner so that the ball rolls thereto for delivery to the ball hoist 12. The pit conveyor belt 20 is pitched downwardly toward the intermediate conveyor 21 and forwardly toward the pit conveyor 17 for conveying the pins collected thereon toward either the conveyor 21 or the conveyor 17. Likewise, any pins collected on the pit conveyor 19 will be directed inwardly toward the conveyor 21 and conveyor 17. To maintain the pitch of these belts, the upper surface of each belt preferably passes over a plate having the desired pitch and over a pair of rollers. Any suitable drive mechanism may be provided for rotating these rollers and belts. For example, a single drive roller 23 may be provided for rotating the belts 17 and 19, while the other roller 24 for the belt 17 and the roller 25 for the belt 19 are preferably but idlers and free to rotate with the belts. Similarly, conveyor belt 20 passes around rollers 26 and 27 and the transverse belt 21 is carried around a pair of rollers 28 and 29, one of each pair being driven and the other of each pair being an idler.

As shown in Fig. 3, roller 24 inclines or slopes toward the front. Roller 27 also inclines or slopes toward the front. On the other hand, as clearly shown in Fig. 3, roller 23 inclines toward the rear. The purpose of this construction is to cause the ball to roll rearwardly and to the right. The pins are always fed by the pit conveyor 17 to the front portion of the pin conveyor 18. The junction of conveyor 17 and conveyor 18 is a possible zone of clogging of pins. To prevent clogging, conveyor 20 is pitched forwardly whereby it places on conveyors 17 or 21 any pins that are not taken up by conveyor 18. Since conveyor 20 is located rearwardly of the junction of conveyors 18 and 17 it insures against perpetuation of a clogged condition. Of course, pins taken up in regular order by conveyor 18 are not returned to conveyor 20.

Fig. 3 is a front elevation showing the novel arrangement of the four pit belts of Fig. 2. This view shows the relative levels of these belts, with the top surface of belt 21 at a slightly lower level than the adjacent ends of belts 19 and 20. Pins which are knocked or swept into the pit may fall on any or all of the four pit belts. Those which fall onto belt 17 are carried to the left toward pin conveyor 18. If this conveyor does not immediately accept a pin because of other interfering pins or because the pin is not in the proper longitudinal position to be accommodated by this conveyor 18, the pin will roll back toward the right onto belt 17 to be carried to the left again or will roll onto belt 20 by which it will be carried to the right onto longitudinal belt 21 which moves toward belt 17. Since belt 21 is at a slightly lower level than the adjacent ends of belts 19 and 20 any pins which may fall on belts 19 and 20 will not roll from one to the other of these belts but will be positively carried forward by belt 21. To insure against the pins slipping the surface of belt 21 is provided with transverse, evenly spaced ridges or strips of rubber, leather or other suitable material.

As shown in Fig. 2, the pins are delivered by the collecting conveyor 18 to a conveyor 73, the function of which is to deposit the pins with their small ends upward into a delivery cup 74, after transporting them rearwardly and transversely of the alley. As clearly shown in Figs. 6, 7, 8, 9 and 10 this conveyor comprises a belt 130 for transporting the pins, a disc member 120 for aiding in transporting the pins around the rear left corner of the pit, and appropriate instrumentalities for guiding and driving the belt. Disk member 120 (Figs. 6 and 7) is generally conical in shape and comprises a top member 230, made of some material that frictionally engages the pins, and a sprocket 131, the sprocket being rigidly secured to member 230 by a tubular member 233. The subassembly comprising elements 131, 236, 233 is mounted for rotation on a shaft 133 by bearings 231 and 232. Also mounted on shaft 133 is a sprocket 132, the sprocket being mounted for rotation by bearings 234, 235. The shaft is rigidly secured to a suitable foundation (not shown) and appropriate means is provided to maintain the axial positions of the sprockets relative to the shaft.

Referring now to Fig. 6 the belt 130 is driven by sprocket 161. This belt drives sprocket 131 in a clockwise direction and sprocket 132 in a counterclockwise direction, as will presently be explained. As best seen in Fig. 7, the course of the lower run of conveyor 73, starting from sprocket 161 is left and then forwardly back to sprocket 162, whereby sprocket 132 turns counterclockwise. The upper run of the conveyor contacts sprocket 131 and the lower run contacts sprocket 132. The belt is provided with a suitable frame 164 whereby the upper run of the belt is guided for motion rearwardly and then around the rear left corner of the pit and finally transversely of the pit. In rounding said corner the edge 165 of the belt travels in overlapping rela-

tion to the outward radial portion a washer member 167, disposed between the disk top member 230 and the sprocket 131.

Belt 130 is driven by sprocket 161 and sprocket 161 is driven by any suitable mechanism which need not be shown specifically herein, because conveyor prime movers are well known to the art. It will be seen that the belt 130 and the chain which carries it must have two degrees of flexure. This requirement is satisfied by the construction shown in Figs. 9 and 10. The belt comprises a plurality of separate top sections 170, 171 and so forth, each having a convex end and a concave end whereby the belt is rotatable around disk member 120 while its edge is presented to the disk member. Each section is rigidly secured to an outer fork member 172. These fork members are formed with a main portion 173 and bifurcated portions 174 and 175. Pivotally secured with respect to each fork member 172 is a fork member 176, which consists of a body portion 177 and bifurcated arms 178 and 179. The pivotal attachment is attained by a bearing 180 having extended portions projecting through apertures in arms 178 and 179, one of which extensions rigidly seats in arm 174 and the other of which extensions projects through arm 175 and terminates in an enlarged head 182. It will be seen that this arrangement of forks 172, 176 provides for flexure of the belt in the horizontal direction, the gear teeth on sprockets 131 and 132 being insertable in the pockets 183 and 184.

In order to provide for vertical flexure of the belt 130, whereby it can be driven by sprocket 161 (Fig. 6), the other end of each fork member 172 is similarly pivotally secured to the other end of each fork member 173, bifurcated arms 185, 186, 187, 189, and bearing 190 being provided for that purpose. It will be seen that the teeth on sprockets 161 and 162 are insertable within pockets 192 and 193.

As shown in Fig. 2, from the collecting conveyor 18 the pins are next delivered to the conveyor 73 which deposits successive pins with their small ends upward into a delivery cup 74.

When the pins, moving along singly, on conveyor 18, reach the rear end of this conveyor they pass on to the receiving end of the conveyor 73 which extends partially around the contact disc 120 rotatably mounted on vertical shaft 133 and driven by sprocket 131. Disk 120 is provided with an inclined surface such that when rotating in a clockwise direction, it exerts friction on the sides of the pins near the butt ends thereof to swing them about on the conveyor if they have entered the conveyor in head foremost orientation. To accomplish this in a satisfactory manner I have found that the speed of disc 120 and conveyor 73 should be somewhat greater than that of conveyor 18 in order to prevent any overlapping of the pins on conveyor 73.

That is, if the butt end is foremost while the pin is on conveyor 18, it will continue in such position on conveyor 73 and will pass around the disc 120 without being affected thereby. However, if the head end happens to be foremost while on conveyor 18, the position of the pin is reversed by the action of disc 120 in conjunction with the reversing device shown in Fig. 6 which comprises curved wall 122 and curved rib 123, the latter of such height above disc 120 that the head end of the pin will project below said rib into the pocket formed by the wall 122, where it is retarded, while the butt end of the pin proceeds foremost on conveyor 73. This reverses the pin

and causes the butt end to proceed foremost on conveyor 73. However, if for any reason a pin 4 should slip past this reversing device, it will move forward on conveyor 73 with the head end foremost until it contacts opposing rollers 124, rotatably mounted on arms 125 which are pivotally mounted on pins 126 supported in brackets 230 (see Fig. 4). The rollers or pressure members 124 engage and bear down on the body of the pins being carried laterally toward the pin cup 74, causing each individual pin to be up-ended as it leaves the conveyor and thus to drop into the cup with its butt end down.

The individual pins standing in the cup 74 are lifted therefrom by the hooks 8 carried on the conveyor 7 (Fig. 1). This conveyor includes a vertical portion extending between the sprocket 79 and the sprockets 80 and 82, as well as a horizontal portion extending from the sprockets 80 and 82 to the sprocket 81. Thus the pins are lifted vertically from the cup 74 to a position well above the level of the bowling alley 1 and are conveyed forwardly across the pit 5 and to a position above the pin setter 10 where they are individually disposed in the chutes 9.

While there has been shown and described what is at present considered to be the preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and substitutions of equivalents may be made therein without departing from the true scope of the invention.

Having thus described my invention, I claim:

1. In a bowling alley operating mechanism, a pin orienting conveyor comprising a chain articulated for flexing both horizontally and vertically; said conveyor chain having an operating span extending partially around a horizontally disposed sprocket and a return span coextensive with but below the operating span and extending partially around a second horizontally disposed sprocket below the first; with return bends of chain extending around idlers at each end of the conveyor and joining the upper and lower spans of chain into an endless loop; together with an articulated belt carried by the chain and adapted to receive bowling-pins, a conical disc adjacent the operating span of the chain and mounted on the upper sprocket; said disc having its peripheral edge adjacent the conveyor chain and having an elevated central portion to engage the base of pins passing around the sprocket and swing them about on the belt, and an obstruction disposed radially outwardly from the sprocket to engage the head ends of pins passing therearound and initiate swinging movement.

2. In a bowling alley operating mechanism, a pin orienting conveyor comprising a horizontally movable belt having a laterally extending curved portion therein; with an obstruction disposed radially outwardly from the curved portion so constructed and arranged as to be engaged by the head ends of bowling-pins transported head end foremost along the conveyor, and frictional means disposed inwardly of the said curved portion to engage the side surfaces of said pins adjacent their butt ends and swing them about as the pins are carried around said curved portion; said frictional means comprising a rotatable disc having its periphery adjacent the conveyor belt at the curved portion thereof, and an elevated central portion projecting above the level of the conveyor to engage pins passing around the disc and swing them about on the belt.

3. In a bowling alley operating mechanism, a

pin orienting conveyor comprising a horizontally movable belt with coacting pin engaging devices disposed on opposite sides of said conveyor and adjacent the path of movement of the pins thereon; said devices being so constructed and arranged as to engage both the head ends and the butt ends of pins moving head end foremost along the conveyor and to swing said pins about on the conveyor belt; said devices comprising a pocket to receive and engage the head ends of said pins and a rotatable friction wheel having a portion projecting above the level of the conveyor for engaging the butt ends of the pins and swinging them about to reverse the orientation of said pins on the conveyor.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,065,448	Hollstein	June 24, 1913
1,190,645	Hedenskoog	July 11, 1916
1,203,216	McFarland	Oct. 31, 1916
1,476,688	Carman	Dec. 11, 1923
1,489,926	Burtchaell	Apr. 8, 1924
1,745,334	Bammann	Jan. 28, 1930
1,784,084	Williams	Dec. 9, 1930
1,896,383	White	Feb. 7, 1933
2,024,846	Burgess et al.	Dec. 17, 1935
2,162,457	Laxo	June 13, 1939
2,284,208	Hedenskoog	May 26, 1942
2,319,925	Flanagan	May 25, 1943
2,341,476	Parra et al.	Feb. 8, 1944
2,359,070	Aasted	Sept. 26, 1944
2,388,708	Bates	Nov. 13, 1945