March 16, 1954

Filed Jan. 27, 1948

T. FLINT

PIN DISTRIBUTING MECHANISM FOR
BOWLING PIN SPOTTING MACHINES

2,672,341

6 Sheets-Sheet 1

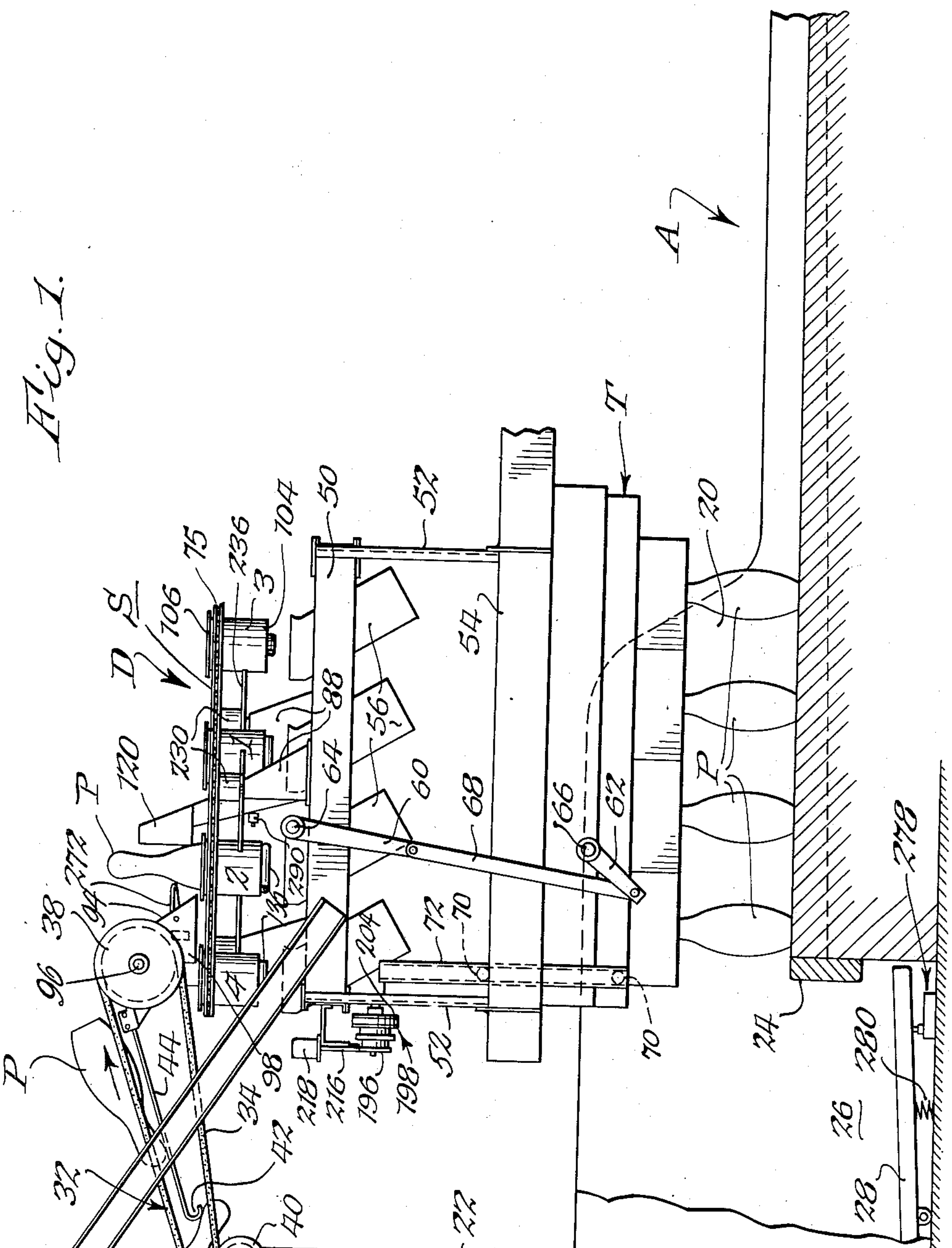

Fig. 1.

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6 Sheets-Sheet 2

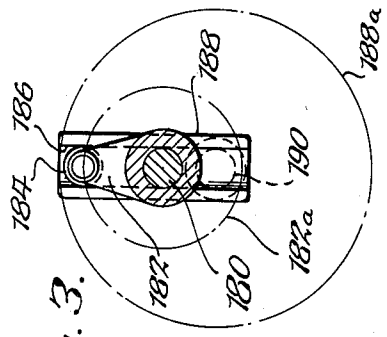

Fig. 3.

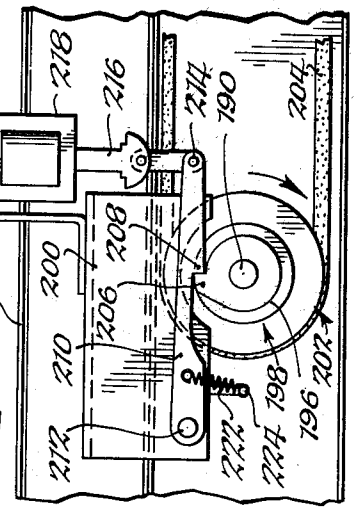

Fig. 4.

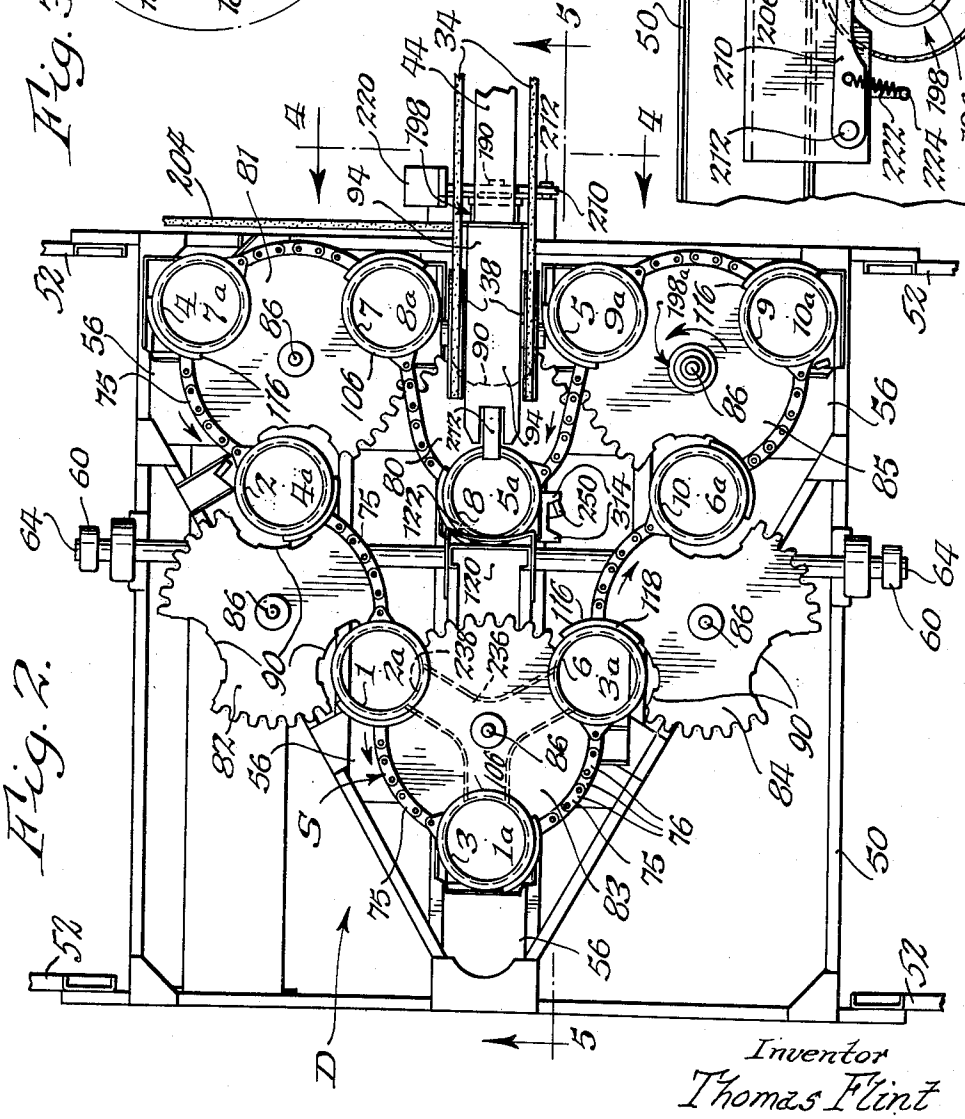

Fig. 2.

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6 Sheets-Sheet 3

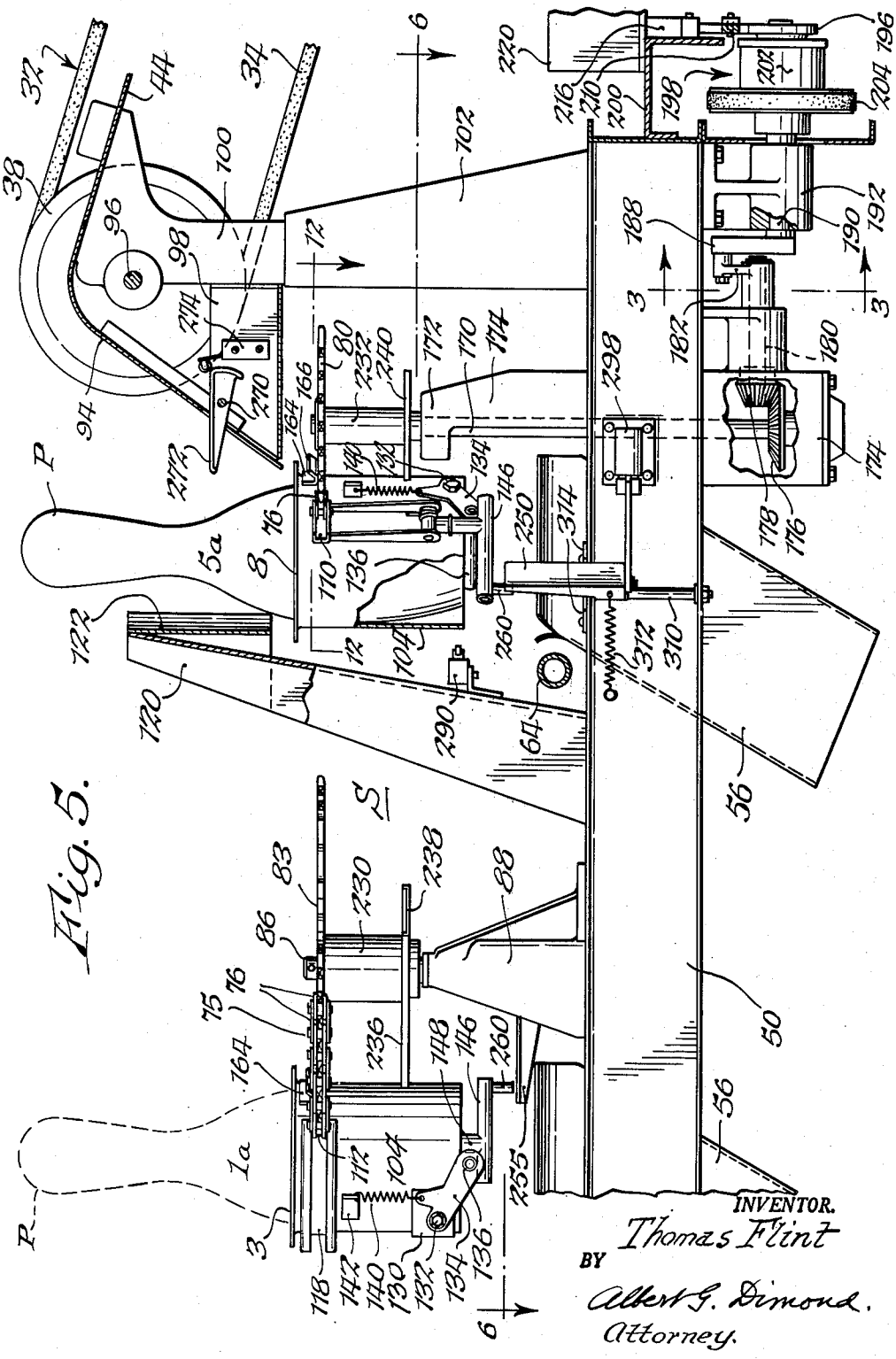

Fig. 5.

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6 Sheets-Sheet 4

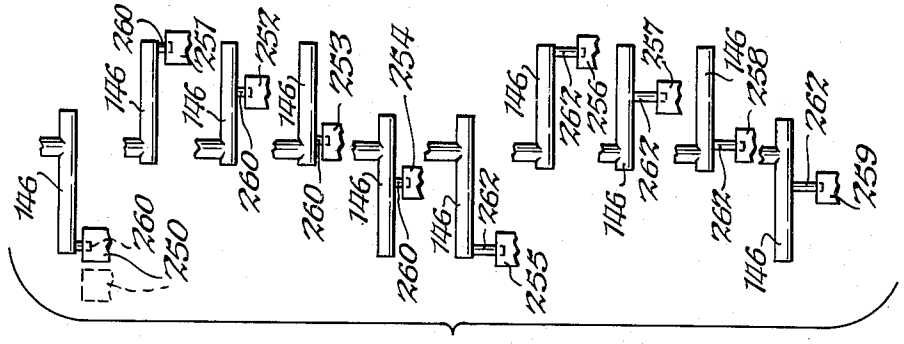

Fig. 7.

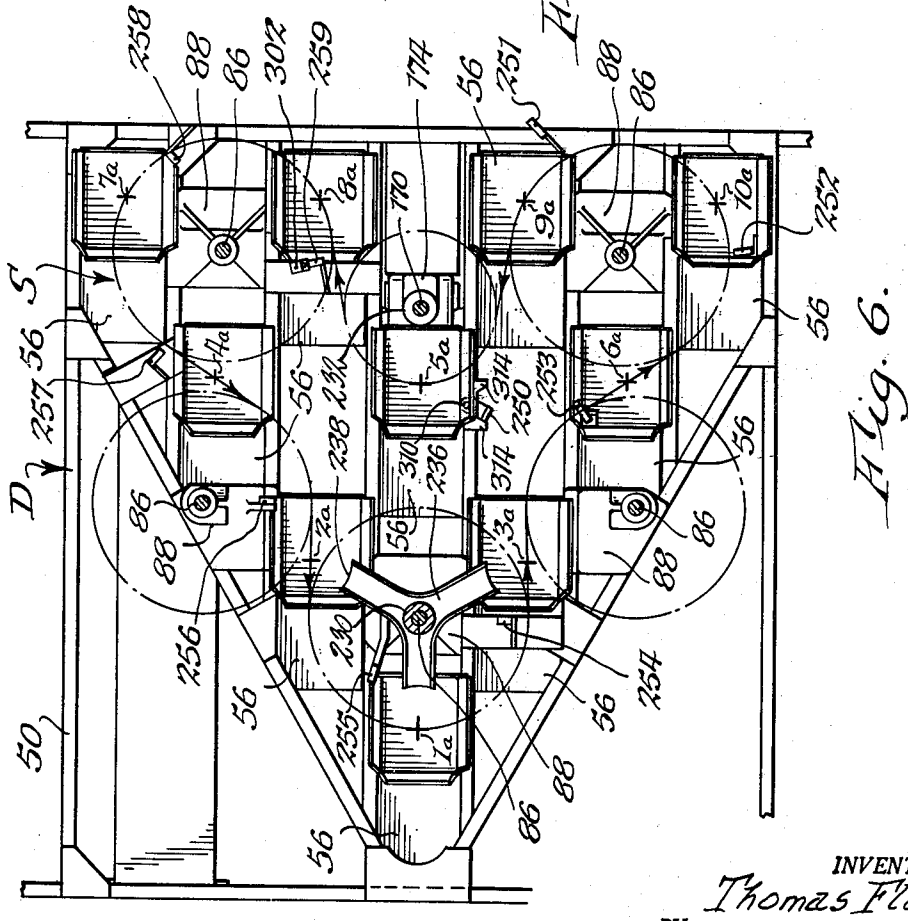

Fig. 6.

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PIN DISTRIBUTING MECHANISM FOR BOWLING PIN SPOTTING MACHINES

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Filed Jan. 27, 1948

6 Sheets-Sheet 5

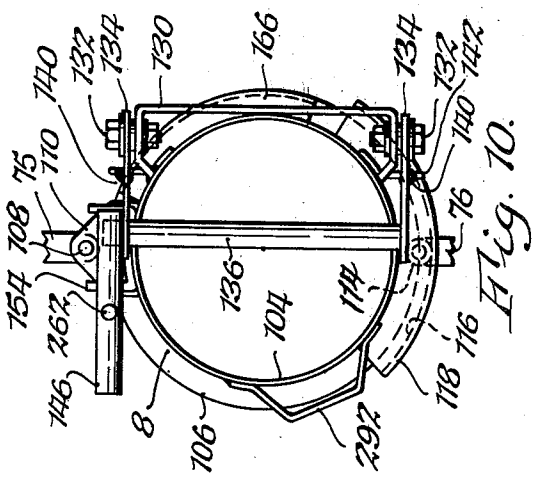

Fig. 10.

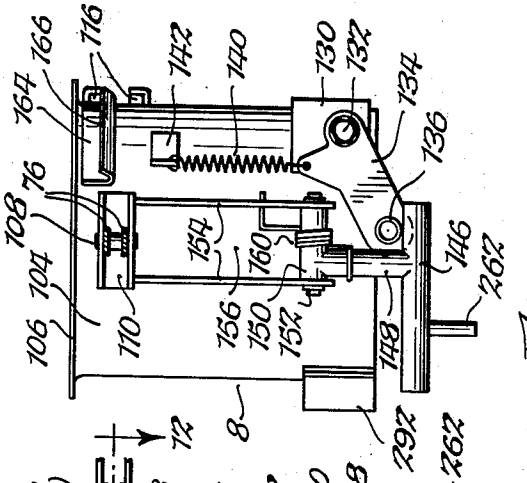

Fig. 9.

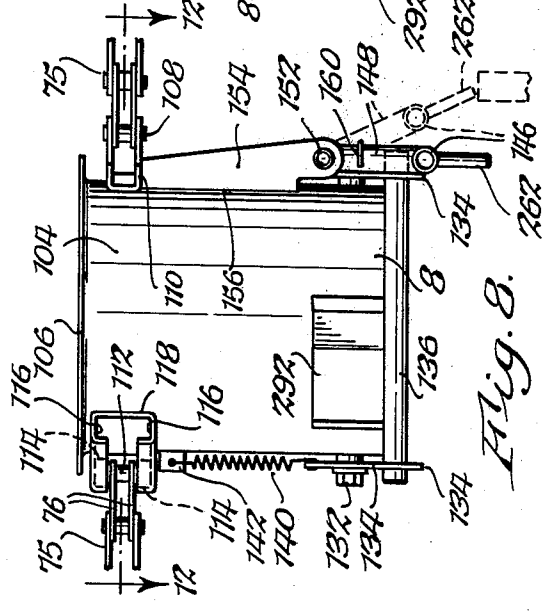

Fig. 8.

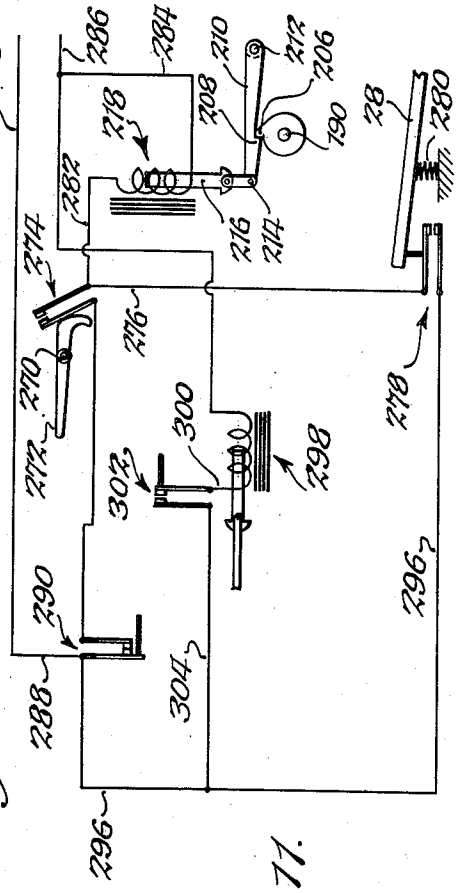

Fig. 11.

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PIN DISTRIBUTING MECHANISM FOR BOWLING PIN SPOTTING MACHINES

2,672,341

Filed Jan. 27, 1948

6 Sheets-Sheet 6

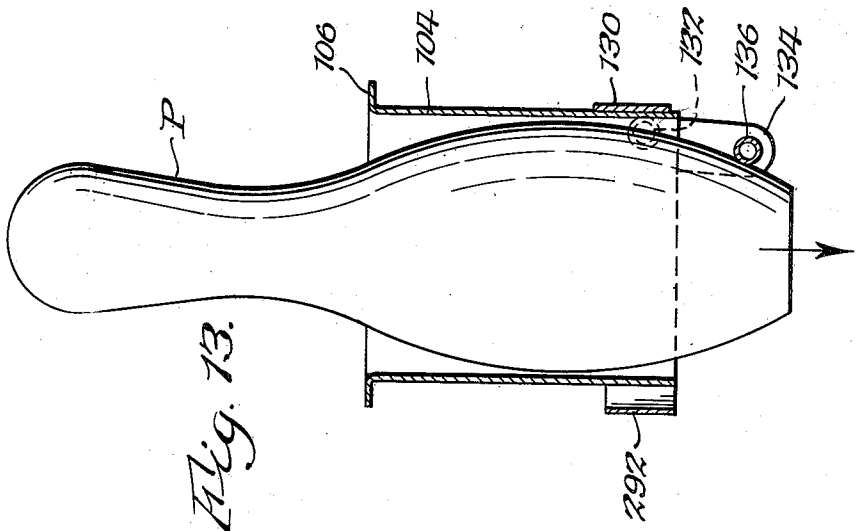

Fig. 13.

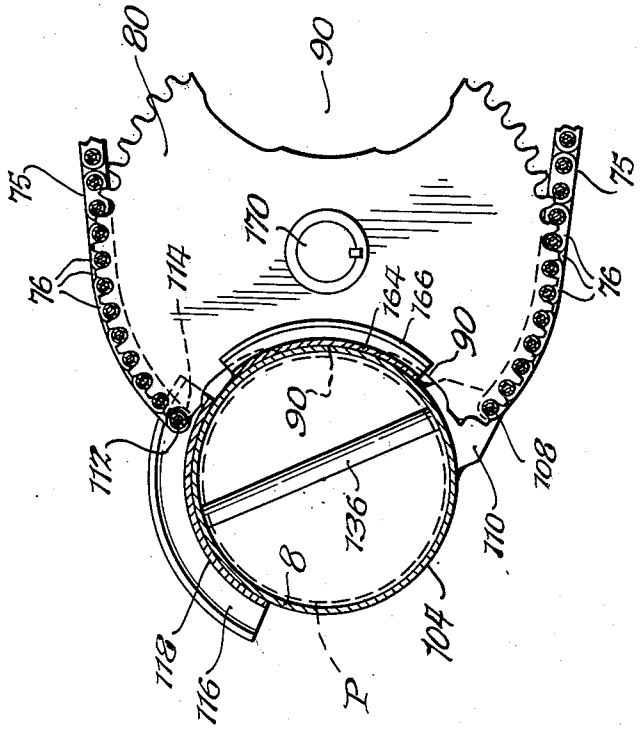

Fig. 12.

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Patented Mar. 16, 1954

2,672,341

UNITED STATES PATENT OFFICE

2,672,341

PIN DISTRIBUTING MECHANISM FOR BOWLING PIN SPOTTING MACHINES

Thomas Flint, Concord, Mass., assignor to American Machine and Foundry Company, a corporation of New Jersey

Application January 27, 1948, Serial No. 4,578

17 Claims. (Cl. 273—43)

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This invention relates to improvements in automatic bowling pin setting machines and particularly to a novel and improved pin distributor or distributing mechanism for use in such machines.

An example of one such machine is disclosed in U. S. Patent No. 2,388,707, November 13, 1945, to R. E. Rundell.

In bowling pin spotting machines of this general type bowling pins which have been swept or removed from a bowling alley into the pit adjacent the end of the alley are conveyed from the pit and delivered to pin distributing mechanism. At the proper time during the operation of the machine bowling pins are discharged from the distributor or delivered therefrom to a device which places them in playing positions on the pin supporting portion of the alley.

While several types of distributor mechanism are known in the art the present invention makes possible a rapid distribution of bowling pins one by one into substantially triangular arrangement corresponding to the playing positions which the several pins in the distributor will take when placed on the alley. The mechanism constituting the invention handles each pin with a minimum of wear and tear, and therefore the life of the pins is increased by its use.

An object of this invention is to provide, in an automatic bowling pin setting machine, novel pin distributing mechanism, by the use of which the operation and general performance of the machine may be improved.

Other objects of the invention are to provide novel and improved pin distributing mechanism, which is simple, compact and sturdy so that, in use it may be operated with the minimum of servicing and replacement of parts; also to provide an improved pin distributing mechanism in which pin cups are mounted in a novel manner; in which a flexible pin carrier having pin cups thereon may traverse a plurality of relatively closely arranged pin stations and from which a set of pins may be simultaneously discharged into a machine element for delivery to the bed of an alley.

Further objects are to provide, in a bowling pin distributing mechanism, improved electrical control means therefor, by which pins are automatically delivered to pin cups, and by which they are released by improved pin supporting and latching and release means.

With these and other objects not specifically mentioned in view, the invention consists in certain combinations which will be hereinafter fully

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described, and set forth in the claims hereunto appended.

In the accompanying drawings which illustrate a preferred embodiment of the invention and form a part of this specification, and in which like characters of reference indicate the same or like parts:

Fig. 1 is a somewhat diagrammatic side elevation of a portion of an automatic pin setting machine, having therein a pin distributor embodying the invention.

Fig. 2 is a plan view, on an enlarged scale, of the pin distributor of this invention.

Fig. 3 is a transverse vertical section, on an enlarged scale, on line 3—3 of Fig. 5, of a portion of the distributor drive mechanism.

Fig. 4 is a transverse vertical section, on enlarged scale, of clutch mechanism for controlling the distributor drive mechanism, taken on line 4—4 of Fig. 2.

Fig. 5 is an enlarged, longitudinal vertical section of the distributor, taken approximately on line 5—5 of Fig. 2.

Fig. 6 is a sectional plan view thereof, on the same scale as Fig. 2, taken approximately on line 6—6 of Fig. 5.

Fig. 7 is a diagrammatic view, illustrating the form of the trip devices on the respective pin cups when in pin discharging relation to a series of stops on the distributor.

Fig. 8 is a side elevation of one of the pin receiving cups of the distributor.

Fig. 9 is a similar elevation viewed at right angles to Fig. 8.

Fig. 10 is a bottom plan view of the cup of Figs. 8 and 9.

Fig. 11 is a diagram of a suitable electrical circuit in which is included instrumentalities for controlling the sequence of operation of the pin distributor.

Fig. 12 is a horizontal section of the cup taken on line 12—12 of Fig. 5.

Fig. 13 is a fragmentary, sectional elevation of one of the pin cups, showing the pin supporting means thereof released and a pin descending through the cup.

The machine, shown somewhat diagrammatically in Fig. 1, and in which a pin distributor of the present invention is operatively arranged, may be suitably mounted at the rear of an alley A. At the sides of the latter are upright walls or kickbacks 20 connected at their rear ends by a vertical cross frame or housing 22. Between the rear wall 24 of the alley and the frame 22, and extending between the kickbacks 20, is a pit

26 into which pins P, felled by thrown balls, or propelled rearwardly by an automatic sweep device (not shown) passing rearwaardly over the alley, are deposited.

Such pins may fall upon a suitable element for assisting their movement to the rear, such for example, as the pivoted and spring supported board or plate 28 which inclines downwardly to the rear, as indicated.

All pins P arriving at the back of the pit 26 come into engagement with and are carried upwardly one after another, by a suitable endless pin conveyor or elevator (not shown) disposed within the frame or housing 22.

A more detailed showing of the parts of the machine briefly described above may be found in Rundell Patent No. 2,388,707 previously referred to.

At a suitable elevation in housing 22 the pin conveyor (not shown) deposits the pins in succession, upon a deflector 30 which delivers the pins, either end foremost, upon a suitable transport device 32 which carries the pins P towards and drops them into the distributor designated generally D.

The distributor D, constructed and operating in accordance with this invention, will be described in detail as this disclosure proceeds.

The pin transport device 32 shown comprises a pair of endless V-belts 34 running on pairs of pulleys 36, 38 and 40, one pair, such as the pulleys 36, being driven in a direction to cause the upper runs of the belts, upon which the pins are carried, to travel forwardly as indicated by the arrow, Fig. 1.

The pins P may fall from the deflector means 30 onto the belts 34 either butt end or handle end foremost, but it is desirable that all pins be delivered to the distributor D butt end foremost so that they will all stand handle end up in the distributor.

Belts 34 are so spaced that pins P received thereon butt foremost will continue thus to the distributor D, as stated (see Fig. 1).

However, when any pins P fall handle foremost on the transport device, see Fig. 1, handle portions of such pins will project downwardly and forwardly between the belts and as the belts move forward, such handle portions will abut an end 42 of a plate 44 disposed between and below the upper runs of the belts. Such pin handles will be held back while the butts thereof proceed and those pins thus turn end for end until the butts thereof project forwardly. Thus all pins are oriented and proceed butt foremost on the belts 34 with their handles dragging along the top of plate 44.

Any other suitable means may be used to convey the pins from the elevator to the distributor D.

The distributor D, which is to be described, is horizontally arranged and is suitably supported on an upper, stationary horizontal skeleton frame 50 secured to spaced uprights 52.

Uprights 52 are fixed to and project upwardly from horizontal side members 54 of the machine frame, Fig. 1.

Also mounted on frame 50 are a set of ten downwardly and forwardly inclined pin guides or delivery chutes 56 arranged in triangular pattern, Fig. 6, corresponding to the pin pattern on the alley A. At an appropriate time a set of ten pins are simultaneously discharged from the distributor D into the chutes 56 through which they are guided to and assume upright positions in spotting table T.

Table T may be of any suitable construction enabling it to reciprocate vertically between an upper position below and adjacent the chutes 56 for receiving pins therefrom and an extreme lower position adjacent the alley to spot pins thereon in playing position.

Movement of table T to and from spotting position relative to alley A may be effected by any suitable means such as the crank arms 60 and 62. Arm 60 is mounted on a rotatable horizontal shaft 64 supported in bearings on the distributor frame 50, Fig. 2, while arm 62 is mounted to oscillate on a similar shaft 66 on the table T. The free ends of these crank arms are pivotally connected to a link 68. As arms 60 travel in a clockwise direction, as viewed in Figure 1, and the pivotal connections between arms 60 and links 68 move past dead center, crank arms 62 move in a counterclockwise direction. In this manner, table T, which is guided vertically in guides 72, described hereinafter, is given a substantially straight line movement to and from alley A.

Table T may be guided up and down by rollers 70 movable in vertical guides 72 fixed to the machine frame 54. The arms 60 and 62, the connecting link 68, rollers 70 and guides 72 are preferably provided at both sides of the machine.

Since this invention concerns itself only with the novel and improved pin distributor D, it is thought that the foregoing brief description of the machine including a suitable table operatively associated with the distributor will suffice to afford a proper understanding of the invention.

The construction and operation of the novel pin distributor D will now be described, the best showing of the general arrangement of its parts being found in Figs. 2 and 5.

The distributor D includes a horizontally disposed, endless and intermittently operable pin carrier, designated generally at S. This carrier S is composed of ten flexible sections or lengths 75 of substantially equal length such as chain formed of a plurality of links 76. Although link chain is shown and described, and is preferred, sections of any other suitable flexible means such as metal cable which has little or no stretch can be used. The sections 75 alternate with and are operatively connected to ten pin receiving cups, individually identified by the numbers 1–10, and corresponding in number with the number of pins usually forming a set.

The pin carrier S is mounted so as to assume a serpentine form such that, when at rest, cups 1–10 are disposed in the conventional triangular pattern shown in Fig. 2, wherein the cups are arranged operatively to correspond to the chutes 56, which deliver pins to table T, arranged in the playing pattern in which pins are disposed thereby on the alley A. To so movably mount the pin carrier S, it operatively engages with and travels upon a plurality of driving and driven members, such as sprockets or gears 80–85.

To assist in an understanding of the operation of the distributor D, each of the pin carrying cups Nos. 1–10 has its identifying numeral connected thereto by a line in Fig. 2. The numerals 1a to 10a, used to designate the stations of the pin pattern, are within the cups at the respective stations in Fig. 2. This pin pattern is of the usual or recognized order in which pins are numbered when on the alley. Thus, although

the cups numbered 1–10 can assume different successive positions as the carrier S is driven during operation, the pattern numbers 1*a*–10*a* will remain as shown.

All of the sprockets 80–85 are disposed in a horizontal plane, and the pin carrier S moves about these sprockets in the direction of the arrows. Fig. 2, under the influence of sprocket 80, which is the drive element for the distributor D.

Sprockets 81–85 are all mounted to rotate on vertical shafts 86 supported in brackets 88 fixed on and extending upwardly from the distributor frame 50, see Figs. 1 and 5.

All members 80–85 are what may be termed mutilated sprockets. Each sprocket 81–85, for example, is cut away to provide three equidistant arcuate cup seats or recesses 90 for the reception of the pin cups. Driving sprocket 80 is smaller than sprockets 81–85, and is provided with two diametrically opposed seats 99 in which pin cups 1–10 are adapted to be seated.

As shown in the drawings, see particularly Figs. 2 and 5, the pulleys 38 carrying the forward ends of the pin delivery belts 34 are arranged longitudinally of the machine and above the distributor D in a position in rear of and adjacent the 5*a* pin spot or station of the pin pattern. Thus when pins leave the forward ends of the belts 34, each pin in succession will descend towards and into any cup on the pin carrier S which may be at station 5*a*.

To assist in guiding pins P, butt end foremost, into cups in the foregoing position there is arranged between the pulleys 38 a downwardly and forwardly inclined guide plate 94. The upper portion of this guide 94 is preferably arranged concentric with the shaft 96 mounting the pulleys 38 and may, in effect, form a continuation of the pin deflecting plate 44, previously described.

Guide plate 94 terminates at its lower forward edge adjacent the rear peripheral portion of any cup at station 5*a* and is there secured to a pair of support plates 98. These are secured to and extend forwardly from a bearing arm 100 at the top of a bracket 102 projecting upwardly from the frame 50. The forward end of plate 44 and the top rear portion of plate 96 may also be secured to the arm 100, as indicated in Fig. 5.

All of the cups Nos. 1 to 10 are of the same size and construction. In Figs. 8–10 cup No. 8 is shown in detail. The cups each comprise a vertical cylindrical member 104 formed of sheet metal, and open at its top and bottom ends. The inside diameter of member 104 is somewhat greater than the maximum diameter of the body of a pin P, whereby pins can enter and be discharged from the cups readily while nevertheless the pins are confined in the cups approximately on the axes of the cups.

The upper edge of each cup preferably terminates in a flaring outwardly directed flange 106.

One end of each of the sprocket chain sections 75 is pivotally secured at 108 to a clip or bracket 110, see Figs. 8 and 9, one of which is fastened to the outside of each cup at the rear thereof when considering the direction of travel of the pin carrier S through the distributor.

The opposite end of each chain section carries in the free end of its terminal link 76 a pivot pin 112 on the upper and lower ends of which rollers 114 are rotatably secured, see Figs. 8 and 12. These rollers are confined in oppositely facing upper and lower tracks 116 formed in a curved guide member 118 rigidly secured to the outer face of each cup diametrically opposite clip 110. The roller tracks 116 are concentric with the axes of the cups.

The station or position 5*a* of distributor D, located as above described, may be referred to as the pin delivery station, and in order to assist pins in properly entering cups at that station as they descend the guide 94, there is disposed opposite that guide a fixed abutment 120 which is secured to the frame 50 and projects upwardly therefrom. This abutment 120 includes a curved vertical plate 122 positioned adjacent to and extending above the edge of any cup at said station. Thus the bottoms or butt ends of pins moving towards a cup at station 5*a* will strike against part 122 and will be diverted thereby into the cup. Overtravel of the pins, and consequent engagement with the top edge of a cup with possible non-delivery of a pin into a cup is thus avoided.

Means are provided which may be releasably positioned so as to extend across the bottoms of the cups to retain pins in upright position therein as shown in Figs. 1 and 5, and which means may be automatically shifted to a position at one side of the cup bottoms to enable pins to pass through the cups into the chutes 56, when desired.

In accordance with this invention such means are automatically controlled so that simultaneous movement thereof to pin releasing position is effected only after pins have been delivered to all cups Nos. 1 to 10 at station 5*a* as a result of step by step movement of the pin carrier S which has caused those cups to successively pass into station 5*a*.

The means above mentioned are shown clearly in Figs. 8–10 in connection with cup No. 8. Such means are substantially duplicated for all cups.

As there shown, each cup has secured to the outside wall thereof near its bottom edge a horizontal bracket 130, each end of which mounts a pivot 132 the axes of which are in alignment. Movably mounted on each pivot 132 is an arm 134. The free ends of these arms 134 have secured therein the opposite ends of a horizontal pin supporting bar or member 136 which extends parallel with the axes of the pivots 132. This bar 136 may be releasably positioned beneath and across the bottom of the cup body 104 in a position to releasably support a pin in said cup.

For this purpose each arm 134 has connected thereto one end of a tension spring 140 the other end of which is attached to a fixed clip 142 on the outer wall of the cup.

The springs 140 thus yieldingly hold the pin supporting bar 136 upwardly against or in contact with the bottom of the cup so as to extend approximately across the center thereof, as clearly seen in Fig. 10.

Obviously, as thus far described, a pin entering a cup would, upon engaging the pin support 136, cause its arms 134 to swing with it about the pivots 132 to a lateral position such that a pin would pass through the cup. Means on each cup for releasably securing the member 136 in pin supporting position across the bottom of a cup is therefore provided, which means may be simultaneously actuated at a selected time to release all the cup supporting bars 136 for simultaneous passage of all pins out of all cups 104.

Such means include a releasable latch bar 146 mounted on each cup so as to extend horizontally alongside and below the cup bottom. Each latch bar has a part which may extend beneath

a projecting end of the pin supporting bar 136 of that cup to lock that bar in pin supporting position, as clearly seen in Figs. 8–10. Each latch bar 146 is provided with a vertical portion 148 attached to a horizontal pivot sleeve 150 through which passes a pivot 152 mounted in spaced flanges 154 projecting from a bracket 156 fastened to the outer wall of the cup.

Surrounding the pivot sleeve 150 is a coil spring 160, one end of which is secured in a hole in one of the flanges 154 and the other end of which extends about the part 148 of the latch bar 146 in a manner to urge the latch inwardly and thereby releasably secure it beneath the pin supporting bar 136, as in Figs. 8–10. By shifting the latch bar 146 outwardly to the dotted line position indicated in Fig. 8, the latch will be moved away from and will release the pin support bar 136. The means for effecting this action is described hereinafter.

The descent of pins P into the cups at station 5a obviously occurs with considerable impact on the pin supporting bars 136. This impact, through the connections described, is transmitted to the cups and, incidentally, to the pivotal connections between those cups and the chain sections 75.

In order to reduce the resulting strains and displacement of parts as a result of the aforementioned impact, each cup is provided, see Figs. 5 and 9, with an exterior reinforcement in the form of a curved metal strip 164, the bottom portion of which is flanged outwardly and upwardly to provide a horizontal rest 166 concentric with the cup. As each cup assumes its stationary pin receiving position at station 5a, its rest 166 will project over and engage upon the top face of drive sprocket 80 at the edge of the cup seat or recess 98 of that sprocket which, at that time, is adjacent the cup wall and concentric with the axis thereof.

Thus the impact of the pin descent, as described, is transmitted to and taken up largely by the sprocket 80.

The reinforcement 164 may, in the movement of cups to other positions in the distributor, engage other sprockets in the manner just described, as for example, at station 1a where it would engage sprocket 83, as seen in Fig. 5. However, such engagement is merely incidental since other than at station 5a, the cup structures do not receive pin impact such as occurs at that station.

As previously stated, cups Nos. 1–10 come to rest only at stations 1a–10a, as illustrated in Fig. 2, and it is desirable to effect gentle starting and stopping of the pin carrier S for movement of the cups into and out of stop positions with preferably an accelerated motion between such positions to thereby reduce the overall time in which a complete cycle of movement of the distributor is made.

For this purpose suitable drive mechanism operatively associated with the sprocket gear 80 is provided. Sprocket gear 80 is rotatably secured to the upper end of a vertical shaft 170 which, below said sprocket 80, is supported in a bearing in the upper end 172 of a bracket 174 fixed to the distributor frame 50. The shaft 170 extends below frame 50 where its lower end is journalled in another bearing in bracket 174. Below frame 50, shaft 170 has fixed thereto a bevel gear 176 which meshes with a bevel pinion 178 fixed on one end of a horizontal shaft 180 rotatably mounted in a bearing extension of the bracket 174. The opposite end of the shaft 180 has secured thereto a crank 182, the free end of which carries a roller 184 engageable in a straight track 186 extending lengthwise of a driving crank arm 188.

This crank arm 188 is secured to one end of a horizontal shaft 190 rotatably mounted in a bearing 192 depending from frame 50 in a manner to position shaft 190 in a vertical plane passing through the axis of shaft 180 and at a distance below the horizontal plane of the axis of said shaft 180. The opposite end of shaft 190 has secured to it a driven section 196 of a suitable one-revolution clutch 198. The driving section 202 of clutch 198 is rotatably supported on shaft 190 and may be constantly driven by a belt 204 from a suitable power source, not shown, incorporated in the machine. The drvien member 196 of the clutch has a projection 206 engagable with an abutment 208 disposed between the ends of a clutch lever 210. One end of that lever is pivoted at 212 on the channel 200 and its other end is pivotally attached at 214 to a link which operatively connects it to an armature or a plunger 216 of a solenoid 218 supported on a bracket 220 on the channel 200.

A tension spring 222 secured to the clutch lever 210 and to a stud 224 yieldingly urges the lever to clutch latching position in engagement with projection 206, as shown in Fig. 4.

The solenoid 218 is arranged in a circuit such as that illustrated in Fig. 11. This circuit is operatively connected to the main control circuit of the machine. The solenoid 218 is intermittently operated to intermittently release clutch 198 and allow the clutch to couple and thereby advance the pin carrier S step by step to carry the pin receiving cups Nos. 1–10 thereof into and out of pin receiving position at station 5a under control of electrical elements in the circuit shown, as will be explained.

The clutch 198 may be a selected commercial type available in the open market. One such is the Hilliard Single Revolution Clutch No. 2, Hilliard Clutch Bulletin No. 239, issued by The Hilliard Corporation, Elmira, New York, to which has been added an overruning clutch to operate reversely, such as found in Hilliard Bulletin 131–D. Thus the clutch 198, when engaged and declutched by lever 210, acts to immediately stop the pin carrier S, whereby the cups are positioned exactly where needed.

Preferably, to avoid back-up of the carrier S by rebound when brought to rest, a second clutch device such as that found in Bulletin 239 above mentioned can be used to hold the carrier S from moving backward from stop position. Such a clutch device 198a is installed between sprocket 85 and its shaft 86, see Fig. 2.

Since the above mentioned clutch devices and their functions are well-known, it is deemed unnecessary to illustrate them in further detail.

Each time the solenoid 218 is actuated to lift the cam lever 210 out of engagement with part 206 of the clutch, the clutch will automatically engage and drive shaft 190 and its attached driving arm 188 through one revolution. Upon examination of Fig. 3, it will be seen that upon rotation of shaft 190 the extremity of crank 188 will turn about the axis of shaft 190 through the circular path 188a shown in dotted lines in that figure. Consequently the engagement of roller 184 in the slide 186 of arm 188 will rotate

crank arm 182 about the axis of shaft 180, as indicated by the smaller dotted line circle 182a.

The extremity of arm 188 will travel about path 188a at a constant rate of speed. However, since the shaft 183 is offset with respect to shaft 199, as stated, the roller 184 carried on the shorter crank arm 182 will, as it traverses the guide 186 in arm 188, travel through the smaller path 182a concentric with the axis of shaft 180. Thus, in order for roller 184 to keep up with the speed of the end of arm 188 about the larger circle 188a, it will gradually increase or accelerate in speed as it leaves the position shown in Fig. 3 until it arrives at its maximum rate diametrically opposite said position after which its speed decreases until it returns to its initial or stop position.

The proportion of the parts of the drive mechanism disposed between crank arm 182 and the sprocket 80 is such as to effect 180° of revolution of shaft 170 and its gear 80, thus advancing all cups one step. For example, cup No. 8 will shift from position 5a to position 8a and all the other cups will move a corresponding distance which will bring all of these cups to rest in axial alignment with the centers of the spot positions 1a–10a. In this movement, through the operation of the drive mechanism, just described, each travel stroke will start and terminate relatively slowly and gently with appreciable acceleration in between to thereby reduce the time required for such movement.

In the position of the parts shown in Fig. 2, it will be noted that some of the pin cups, such as cups Nos. 1, 2, 6 and 10 are out of engagement with the seats of the adjacent sprocket wheels 81, 82, 84 and 85. When thus positioned these cups are supported by chain sections 75 connected thereto which are in mesh with teeth of sprockets 81, 82, 84 and 85.

However, it will be noted that in the positions occupied at this time by the other cups Nos. 3, 4, 7, 8, 5 and 9 the chain sections 75 which are connected to such cups are extending in curved paths about and in mesh with the teeth of the respective sprockets. This is, in effect, as if the cups constituted links of the chain since these cups are in mesh with the sprockets by their engagement in the seats 90 thereof.

The importance of the slidable connection of one end of each chain section to an adjacent cup through rollers 114 and curved tracks 118 will now be understood.

With such an arrangement the effective or operative length of the chain 75 as a whole is not changed. When the cups are in positions 2a, 3a, 4a and 6a, for example, the chain sections at opposite sides of those cups are disposed on a straight line crossing the axes of the cups. However, in the position of a cup such as cup No. 4 at position 7a, ends of the chain sections attached thereto do not pass in a straight line through the cup axis, but in effect pass through a curved line crossing the cup axis and concentric with the axis of sprocket 81.

Here the cup is seated in a sprocket and acts as one of the sections of chain, as stated above. This is for the reason that the rollers 114 attached to one of the chain sections connected to that cup have travelled in the track portions 116 from a central position in that track towards one end thereof.

It will be understood that in different positions of the cups in their travel about the distributor said chain rollers 114 automatically shift in the tracks 116 on the cups in one direction or another and thereby maintain the chain at a constant overall length.

By this arrangement a simple and sure operative arrangement of the pin carrier S is effected whereby all of the cups are maintained in their intended positions and come to rest directly over the pin spots or stations 1a–10a without the use of additional sprockets or other takeup devices. In this manner the closest and most compact arrangement possible of the sprockets 80–85 and of all ten cups on the distributor is effected.

It has been thought desirable to provide means for steadying the cups Nos. 1–10 in their movements through the distributor, and especially to hold the cups against tilting or wobbling on their pivots relatively to the chain sections 75 of the carrier S.

For this purpose there is shown in Figs. 1, 5 and 6 means associated with the sprocket wheels 80–85. Each of the wheels 81–85 has a hub 230 surmounting its shaft, while wheel 80 has a simihub 232, Fig. 5. Fixed to each hub 230 at a distance below its sprocket is a three armed steady-rest 236, see Fig. 6. Each arm terminates in a seat 238 in vertical alignment and concentric with the cup seats 90 above, to thereby engage the same cups and co-operate with said upper seats in holding the cups in upright positions.

Hub 232 of wheel 80 has a two-armed rest 240, the seats of which align with the two seats in that wheel 80. The operation of the rest 240 is identical with that of the other rests 236.

In order to explain the operation of the herein disclosed pin distributor, reference is made to Fig. 2 in which the pin carrier S should be considered as having travelled or indexed to move nine steps. Therefore, cup No. 8 is at the loading station 5a where a pin has been dropped into it; cup No. 7 is at station 8a; cup No. 4 at station 7a, and so on.

If the chain is now indexed to make one more step, cup No. 8 will move from the loading station 5a to position 8a; cup No. 5 will move from position 9a to station 5a; cup No. 9 from 10a to 9a; cup No. 10 from 6a to 10a, with the other cups moving correspondingly.

When this step has been taken, it will be readily seen that all cups Nos. 1–10 will be loaded and will be at the corresponding stations 1a–10a and a set of pins will be ready for discharge from the distributor.

After this set of pins has been unloaded, the first pin of the next set will be deposited in cup No. 5 while it is still at the loading station 5a and before the carrier S is given its first step forward in the next cycle. Thus when the carrier S has moved one more step, the No. 9 cup will move to station 5a and receive a pin. The cups which follow will all be loaded ready for the final step which carries the loaded cups to the pin discharge position.

Means are provided for simultaneously engaging and swinging aside all of the latches 146 of cups Nos. 1–10 when the pin carrier S has received its tenth indexing movement to bring the cups, as numbered, into alignment with the pin spot positions 1a–10a, as just explained. The construction and arrangement of said means is such that this simultaneous release of all the pin support members 136 can only be effected when all of the loaded cups have been moved to the unloading position. The releasing means includes a plurality of latch devices, one of which is arranged on the frame 50 for co-operative re-

lation with the pin support of an adjacent cup when in pin discharge position. The stops at positions 1*a*–4*a* inclusive and those at positions 6*a*–10*a* inclusive, are fixed while the stop at station 5*a* is movable into and out of a position in which it can engage and release the pin support for the No. 5 cup, for a reason to be explained.

In Figs. 6 and 7 is shown diagrammatically a set of ten stops 250–259 inclusive, which co-operate respectively with latch bars 146 for the pin holding bars 136 for cups Nos. 5, 9, 10, 6, 3, 1, 2, 4, 7 and 8. Since it is desired that these stops be effective to release the pins only after the cups have been advanced ten steps, as stated, it is necessary that these stops be so arranged as to allow free travel of the pin carrier S without the stops engaging and releasing the latches 146 during any of the nine step by step movements of the carrier S in a given cycle previous to its arrival at the tenth or pin discharge position.

For this purpose each latch 146 is provided with a depending stud. On the latch bars 146 on cups Nos. 5, 9, 10, 6 and 3 these studs, designated 260, are relatively short and each is positioned either at a different distance from the free end of its bar 146 or if at the same distance, as on the bars for cups Nos. 5 and 9, these bars occupy different relative positions on the cups.

The latch bars 146 for cups Nos. 1, 2, 4, 7 and 8 are provided with similarly arranged depending studs 262 which, however, are longer than the studs 260.

As seen in Fig. 7, the upper ends of stops 250–254 inclusive, are relatively close to the latch bars 146. In Fig. 6, it will be seen that these stops 250–254 are disposed in relatively different angular positions with respect to the cup centers Nos. 5, 9, 10, 6 and 3 with which they are associated and which are indicated by cross marks in that figure.

Stops 255–259 inclusive however, have their upper ends a greater distance below the latch bars 146 than those of the stops 250–254. Thus, while as indicated, the studs 262 can, when in proper position, engage the related stops 255–259, the studs 260 can pass over the last mentioned stops without contacting them.

Fig. 6 likewise illustrates the angular disposition of stops 255–259 relatively to the cross marks indicating the cup centers Nos. 1, 2, 4, 7 and 8.

The foregoing arrangement is such that all studs 260 and 262 can either pass freely over or laterally by all of the stops 250–259 without engagement therewith until the tenth step has been effected, at which time all of the studs 260 and 262 may come into engagement with their intended stops, as in Fig. 7. At such time movable stop 250 at station 5*a* will be automatically moved from its dotted line position Fig. 7 to its full line position. This movement of stop 250 will be explained in connection with the electrical circuit shown in Fig. 11.

As shown in Fig. 5, there is pivotally mounted at 270 on the guide plate 94 a trip lever 272 one end of which projects into the path of pins descending the guide plate so that each time a pin passes down that plate towards pin receiving station 5*a*, lever 272 will be engaged and swung about its pivot. The other end of trip lever 272 is operatively associated with a micro-switch 274 which, as shown in the diagram Fig. 11 is normally open. Each time lever 272 is actuated it will momentarily close the contacts of the micro-switch 274 and thereby energize a solenoid 218. This action operates the one-revolution clutch 198 to effect a one step advance movement of the pin carrier S, except at one specific time in the cycle, as will be explained.

Switch 274 is connected by a line 276 to one side of a normally open pit switch 278 arranged in the pit beneath the pivoted plate 28. Switch 278 is retained in open position by a spring 280 or other yielding member arranged beneath platform 28 in a mannerto urge it upwardly into the position shown. Downward pressure on platform 28, as by the arrival of a ball thereon, will cause it to swing downwardly about its pivot and close switch 278.

Micro-switch 274 is connected by another line 282 to one side of solenoid 218, the other side of which is connected by conductor 284 to power line 286.

The other power line 288 leads to a normally closed micro-switch 290 mounted on bracket 120 in position to be engaged by a cam 292 fixed to and projecting from the outside wall of cup No. 8 when that cup enters station 5*a*. That side of switch 290 which is connected to conductor 288 is also connected by conductor 296 to the other side of the pit switch 278.

Power line 286 is also connected to one side of a solenoid 298 mounted on the distributor frame 50 below station 5*a*. Solenoid 298 is connected by line 300 to a normally open micro-switch 302 also arranged in the path of cam 292 on cup No. 8 so as to be engaged thereby at a selected time after it has engaged and opened switch 290. A branch line 304 connects the switch 302 to line 296.

As described above, the delivery of pins one after another into cups at station 5*a* actuates micro-switch 274 through trip lever 272 and causes an advance movement of the pin carrier S by energizing solenoid 218 and releasing clutch 198 for a one revolution movement.

However, when cup No. 8 reaches station 5*a*, a pin descending into that cup, while actuating micro-switch 274, does not then effect the tenth step or advance movement of chain carrier S since cam 292 on cup No. 8 will have engaged and opened micro-switch 290. That switch is wired in series with micro-switch 274 so that when open it will hold this circuit open and prevent energization of solenoid 218.

As best seen in Fig. 5, the armature of solenoid 298 is operatively connected to movable stop 250, before mentioned, which is pivoted on a part of the distributor frame 50 at 310. This stop 250 is normally held out of the path of studs 260 or 262 on the latch bars 146 by a tension spring 312. This clearance position of stop 250 is illustrated in Fig. 6 where projections 314 for limiting its movement about its pivot 310 are also shown.

As stated, when the tenth pin is delivered into cup No. 8 at station 5*a* the advance of the pin carrier S is momentarily prevented by the opening of switch 290. However, before the ten loaded pins can be discharged, the pin carrier S must advance one step further in order to bring the loaded cups Nos. 1–10 to the pin positions 1*a*–10*a*.

In order to understand the operation which effects such last step of the pin carrier S in a manner to overcome the open circuit condition caused by actuation of switch 290, certain operations in a typical frame of bowling will be considered.

At the start of such a frame one set of pins is in playing position on the alley, while another

set is in the cups of the distributor in the ninth step position just mentioned. The machine is now in condition for the first ball of a frame to be rolled.

Upon rolling the first ball, its arrvial in the pit will depress platform 28 and close pit switch 278. Closing of this switch will cause current from line 283 to bypass the now open switch 290 by way of conductor 296 and through closed switch 278, will pass through lines 276 and 282 to solenoid 218 and thence back to power line 286. Current thus passing through solenoid 218 will cause the clutch 198 to be released and make a one-revolution movement, thus driving the pin carrier S through its tenth step to bring all of the loaded cups into position where the pins therein can be discharged.

As the carrier moves to this position, cam 292 on cup No. 8 will engage and close micro-switch 302, thus operating the solenoid 298 to swing movable stop 250 into position for obstructing stud 260 on latch bar 146 of cup No. 8.

In the last stage of this tenth step of the pin carrier S all of the stops 256–259 will simultaneously intercept studs 260 and 262 and all of the latch bars 146 will be swung clear of the pin supporting bars 136 which they have been supporting. This action will cause the pins in the cups, through gravity, to exert downward force on and push their supporting rods 136 to one side about pivots 132. The pins will all thus be free to leave the cups of the pin carrier and pass through chutes 56 into the table T.

Just before cup No. 8 comes to rest at position 8*a*, but not before the pin in cup No. 5 has been discharged at position 5*a*, cam 292 thereon passes out of engagement with and permits micro-switch 302 to open. This de-energizes solenoid 298 causing pivoted stop 250 at station 5*a* to be shifted from its latch engaging position to a position wherein it will be free of stud 260 on latch 146 for cup No. 5. By such action pin supporting rod 136 of cup No. 5 will be free to swing to pin supporting position beneath the cup. It will be locked in that position at once by the return of released latch bar 146 to latching position through its spring 160.

It will be seen that cup No. 5 at position 5*a* is now conditioned to receive and support the next pin to pass downwardly over guide plate 94 from delivery belts 34.

This will be the first pin of a new set. In its movement into cup No. 5, that pin will actuate micro-switch 274 through trip lever 272 thereby causing the pin carrier S to advance the first step of a new cycle as the result of energization of solenoid 218 and the resultant one revolution operation of clutch 198.

This movement of the carrier will carry loaded cup No. 5 from position 5*a* to position 8*a*.

Simultaneously all of the studs 260 and 262 on the other latch bars 146 will ride over their respective stops 251–259 and free the latch bars. Since the ten pins of the former set have left the cups the pin supporting bars 136 of the unloaded cups Nos. 1–4 and Nos. 6–10 will have swung back to pin supporting position by action of their springs 140. Thus, as the latch bars free themselves in the step movement of the pin carrier just considered they will automatically return into position to latch all bars 136 under influence of their springs 160.

Pin support bar 136 of cup No. 5 has already been latched at station 5*a* and is supporting a pin in that cup during the foregoing step movement of the pin carrier S, as previously stated.

By the subsequent delivery of pins one after another downwardly over the guide plate 94, the pin carrier S will be caused to advance step by step until ten cups have again been filled and another cycle of the distributor completed.

After the first ball of a frame has been rolled, as previously mentioned, a set of pins in distributor D is delivered into the spotter cups. Pins knocked into the pit are elevated through the rear section 22 and are delivered one after another into the distributor D by the belts 34. The table T descends and engages tops of pins remaining standing on the alley, electrically indicating the presence of such pins, if any, and mechanically lifts those pins from the alley.

The sweep mechanism (not shown) then removes deadwood from the alley into the pit for elevation at the rear, as stated. The table again descends and replaces the picked-up pins on their previous spots on the alley and returns to its upper position still carrying the set of ten pins which had been discharged into it from the distributor.

When a second ball of a frame is rolled, the action is largely a repetition of that occurring as the result of the rolling of the first ball. An exception is that the distributor does not discharge additional pins into the top of the table which is still carrying the set of pins just mentioned because the means for discharging pins from distributor D is incapacitated by the machine control. Also any pins remaining standing on the alley are not picked up by a second descent of the table but are swept with the deadwood, if any, into the pit.

The overall action of the machine is such that the table now deposits on the alley the ten pins which it has been carrying.

Since a set of pins has been deposited in the distributor the machine is ready to receive the first ball of another frame. Variations in the cyclic operation of the machine as dictated by a strike frame of bowling, or other such variations, while modifying the cyclic operation of the machine as a whole, do not basically alter the operation of the distributor. This is true since the operation of the distributor is dependent upon, and a cycle of operation thereof is begun by, the delivery into it of the first pin of a set and its cycle of operation is terminated by the delivery into it of the tenth pin of the same set.

Since we are not concerned further with the operation of the machine as a whole, further reference thereto is omitted.

I claim:

1. In an automatic bowling pin setting machine having a spotting device formed to receive a selected number of pins in triangular playing pattern and to place said pins on an alley, pin distributing mechanism including spaced chain sections, pin cups alternating therewith and connected to adjacent chain sections to form an endless pin carrier, a cup loading station, means for moving said carrier through a closed path and locating said cups in succession at said station, a conveyor constructed and arranged to deliver a bowling pin to each empty cup located at said station, mechanism for moving filled cups from said station and locating them in substantially triangular pin pattern arrangement above said device, and means effecting the simultaneous discharge of all of said pins from said cups into said device.

2. In an automatic bowling pin setting machine, pin distributing mechanism including an endless pin carrier composed of sections of chain of equal length and pin cups alternating therewith and pivoted to the ends of adjacent chain sections for movement therewith, supports releasably holding pins in each of said cups, and means for driving said endless pin carrier in a serpentine path wherein all said cups pass seriatim through points defining a selected pattern, means for intermittently arresting said pin carrier so that the cups successively come to rest at one of said points for receiving a pin thereat, said points corresponding in number to the number of cups on said pin carrier, all of said points being traversed by said serpentine path, and said cups simultaneously entering and leaving said stations upon movement of said pin carrier, and means for moving said supports to effect the discharge of pins from said cups.

3. In an automatic pin setting machine, pin distributing mechanism including an endless pin carrier composed of flexible sections and pin cups alternating therewith and connected to the ends of adjacent flexible sections, a plurality of stations spaced in a triangular pin pattern upon a closed path traversed by said pin carrier, means for driving said pin carrier step by step in increments corresponding to the distance along said closed path between any two adjacent stations, whereby said carrier may simultaneously move all cups from station to station of said triangular pin pattern, a plurality of substantially triangularly arranged pin spotting units, means mounting said units beneath said stations, pin cup discharge means, and operating mechanism for actuating said discharge means simultaneously to effect the simultaneous delivery of all pins from said cups into said units.

4. In an automatic bowling pin setting machine, pin distributing mechanism including an endless pin carrier composed of sections of chain and a plurality of pin cups alternating therewith, sprockets supporting said pin carrier substantially throughout its entire length for movement in a serpentine path, each of said cups having a fixed pivot at one side, and a slidably mounted pivot at its opposite side, said pivots connecting said cup to oppositely disposed adjacent ends of two of said chain sections, said slidable pivot connections being movable substantially horizontally relatively to the direction of movement of said cups to enable said chain sections to mesh with said sprockets in said serpentine movement of said pin carrier.

5. In an automatic bowling pin setting machine, pin distributing mechanism including an endless flexible pin carrier composed of sections of chain of equal length and pin cups alternating therewith and pivoted to the ends of adjacent chain sections, supports mounting said carrier to travel said cups in a generally horizontal triangular path of travel means for driving said endless pin carrier, a plurality of substantially triangularly arranged stations corresponding in number to the number of cups on said pin carrier and all of which are traversed by said cups in said movement of said carrier, means for delivering pins in succession to said cups at one of said stations, said carrier drive means being operable to move said carrier step by step to bring said cups to rest in succession at said one station to receive a pin thereat, means operable by each pin delivered to a cup at said station to initiate said step movement of said carrier to place successive cups at said delivery station, and after the delivery of a pin into the last empty cup to locate said filled cups above said stations for delivery of pins thereto.

6. In a pin distributing mechanism for a bowling pin spotting machine, a substantially horizontal endless pin carrier, including a plurality of bowling pin holders mounted substantially equidistantly along said carrier, a plurality of sprockets supporting said carrier for movement of said holders in a substantially horizontal plane, said sprockets being provided with peripheral recesses accommodating said holders as said carrier travels around said sprockets, means mounting said sprockets for positioning three of said holders at the apices of a triangle and the remaining holders in an arrangement therewith conforming to the triangular arrangement of bowling pins on the playing bed of a bowling alley, means for delivering bowling pins in succession to said holders, and means for simultaneously discharging all of said trangularly arranged pins from said holders.

7. In a bowling pin distributing mechanism as described in claim 6, a pin support mounted on each of said holders, means normally maintaining each of said supports in pin supporting relation relative to the bottom of each of said holders, and wherein said means for discharging all of said pins from said holders includes means operative when each of said holders contains a pin for moving said supports out of engagement with the base of a bowling pin.

8. In a pin distributing mechanism for an automatic bowling pin setting machine, a pin loading station, an endless pin carrier mounted above the bed of a bowling alley, a plurality of spaced pin cups mounted on said carrier, said cups being constructed and arranged to loosely encircle the butt ends of bowling pins, movable members mounting said carrier for travel in a closed generally triangular path, such that said cups carried thereby are adapted to be disposed in a substantially triangular pin playing arrangement, a movable support carried by each cup for supporting a bowling pin handle end upright therein, means for driving said members to move said endless pin carrier and to dispose said cups successively at said loading station, and means for simultaneously releasing each of said movable supports for movement out of engagement with a pin supported thereby for discharging said pins from said cups for transfer to said bed of said bowling alley.

9. In an automatic bowling pin setting machine, a pin loading station, pin distributing mechanism including an endless pin carrier composed of sections of chain of equal length and pin cups alternating therewith and connected to the ends of adjacent chain sections, means mounting said carrier above the bed of a bowling alley, said means including a plurality of sprocket wheels arranged to mount said carrier for movement in a closed path, said plurality of sprocket wheels including three sprocket wheels mounted on shafts forming the apices of a triangle, said sprockets having spaced peripheral seats therein into which said pin cups may mesh while said chain sections mesh with the teeth of said sprockets, so that peripheral portions of adjacent sprockets may be spaced apart a distance substantially less than the diameter of said pin cups and said cups are adapted to be disposed in a substantially triangular pin playing arrangement, mechanism for driving said sprocket wheels

to move said endless pin carrier and dispose said pin cups successively at said loading station, a pin support for each of said cups, means for securing each of said supports in pin holding position, and means for releasing said supports for discharge of pins from said cups for transfer to said bed of said bowling alley.

10. In an automatic bowling pin setting machine, a pin loading station, pin distributing mechanism including an endless pin carrier composed of sections of chain and pin cups alternating therewith and pivoted to the ends of adjacent chain sections, mechanism operatively supporting said pin carrier above the bed of a bowling alley, including members mounting said carrier for travel in a generally triangular path such that said cups are adapted to be disposed in a substantially triangular pin playing arrangement, means for driving said endless pin carrier to locate said pin cups successively at said loading station, a plurality of stations arranged in a triangular pin pattern traversed by said path, said cups being spaced to simultaneously enter said stations upon movement of said pin carrier, and each cup passing in succession through all of said stations, a pin support for each of said cups, means for securing each of said supports in pin holding position, and means for releasing said supports for discharge of pins from said cups for transfer to said bed of said alley.

11. In an automatic bowling pin setting machine, pin distributing mechanism including an endless flexible pin carrier composed of sections of chain of equal length and pin cups alternating therewith and connected to the ends of adjacent chain sections, and means for driving said endless pin carrier in a serpentine path in which said pin cups move in succession through a pin delivery station, means for delivering a pin in succession to each cup at said station, each cup being open at opposite ends and having a movable pin support at one of said ends, latch means for each cup to releasably secure its pin support in pin holding position during and after passing of each cup through said delivery station and until all said cups have received pins, a pin discharge station for each of said cups, latch release stops located adjacent each of said discharge stations, means mounting said latch release stops in such position as to engage selectively with corresponding cup latch means to move said supports to pin release positions in response to the movement of said cups to their respective pin discharge stations.

12. In an automatic bowling pin setting machine, pin distributing mechanism including an endless pin carrier having pin cups mounted substantially equidistantly therealong, means for driving said endless pin carrier in a closed path in which said pin cups move in succession through a plurality of discharge stations, one of which also serves as a pin delivery station, means for interrupting the movement of said carrier upon arrival of empty cups at said delivery station, means for delivering a pin, in succession, to each empty cup located at said delivery station, means associated with each cup for releasably supporting a pin therein, fixed stops at each station other than said delivery station positioned to allow loaded cups to traverse said stations until all cups are loaded, and a movable stop at said delivery station normally positioned to likewise allow loaded cups to pass through that station, a trip element for each of said releasable supporting means, each element being so positioned on its respective cup as to pass all of said stops except the stop associated with the corresponding discharge station of its cup, means for actuating said carrier driving means to move said cup last to be loaded away from said delivery station and locate said previously loaded cups in pin discharging position at said stations relative to said fixed stops, means for moving said movable stop into position to be engaged by its corresponding trip element, supports mounting said fixed stops such that in response to the movement of said loaded cups to pin delivery position, each stop will then intercept the trip element for the releasable pin supporting means on a selected cup to release the pins from all cups.

13. In an automatic bowling pin setting machine, pin distributing mechanism including an endless pin carrier, spaced pin cups operatively connected to said carrier, means for driving said endless pin carrier to carry said pin cups in succession through a plurality of discharge stations, one of which serves as a pin delivery station at which all cups successively come to rest, means for delivering pins in succession, to each cup at said delivery station, support means associated with each cup for releasably supporting a pin therein, fixed stops at each station other than said delivery station, means supporting said fixed stops to allow loaded cups to traverse said stations until all cups are loaded, differently positioned trip elements carried by each of said cups for each of said releasable support means, means mounting said trip elements on said cups so as to pass all of said stops except the stop associated with the corresponding discharge station, a movable stop at said delivery station, means normally positioning said movable stop in inoperative position until all cups are loaded, a device for actuating said driving means in response to the delivery of a pin into the last of said cups to be loaded for engaging all of said trip elements with said fixed stops except the trip element on the last of said cups to be loaded, and means operative substantially simultaneously therewith for moving said movable stop to engage said last-named trip element, said stops being operative in response to said last movement of said driving means and the engagement of said trip elements with said stops for moving said trip elements to effect the release of said pin support means from engagement with pins held thereby to effect the discharge of all pins from all of said cups.

14. In an automatic bowling pin setting machine, pin distributing mechanism including an endless pin carrier, pin cups carried by said carrier, means for driving said pin carrier, means on each cup for releasably supporting a pin therein, an electrical circuit including a switch operable by delivered pins to effect a step by step operation of said driving means of said carrier, a plurality of intermediate stations in which said cups are brought to rest by said carrier including a pin delivery station, pin delivery means at said delivery station, stops at each station other than said delivery station positioned to allow loaded cups to traverse said stations until all cups are loaded, a movable stop at said delivery station, means normally locating said movable stop in an inoperative position to likewise allow loaded cups to pass through that station, a solenoid operatively connected to said movable stop, and a solenoid switch in said circuit, means operative in response to the delivery of a pin into the last of said cups to be loaded at said pin delivery station to actuate said solenoid switch and

energize said solenoid to shift said movable stop to an operative position, other means operable when all cups have been loaded for operating said carrier driving means to move said carrier with said loaded cups and locate said cups in pin releasing position at said stations relative to said stops, and pin release means for said cups operated by said stops in response to the movement of said cups to said pin releasing position for simultaneously moving all of said pin supporting means on all of said cups to pin discharging position.

15. In a bowling pin distributor for a bowling pin spotting machine having a pin setting frame for setting pins on a bowling alley, an endless pin carrier, said carrier comprising a plurality of alternately connected flexible sections and substantially cylindrical pin supporting holders, a movable pin holding device carried by each of said holders for maintaining a bowling pin handle end upright therein, separate means for moving each of said movable pin holding devices to free said pins in said holders for discharging said pins therefrom, means for supporting said carrier in said position to maintain said holders in substantially triangular pin playing arrangement, and similarly arranged pin receiving devices on said frame and located beneath said holders of said distributor for receiving said pins discharged from said holders.

16. In an automatic bowling pin setting machine having a spotting device, a plurality of pin spotting units mounted on said device and arranged in substantially triangular playing pattern, means for moving said device to and from a bowling alley to place pins on said alley, pin distributing mechanism including spaced flexible sections, pin cups alternating therewith and connected to adjacent flexible sections to form an endless pin carrier, a cup loading station, means for moving said carrier through a serpentine path to locate said cups seriatim at said station for delivery of pins in succession thereinto and to locate filled cups in discharge positions corresponding to the arrangement of said units on said device, means for depositing pins in said cups at said loading station, and means for discharging said pins in said cups to said spotting units.

17. In an automatic bowling pin setting machine, pin distributing mechanism including an endless pin carrier comprising flexible sections and pin cups alternating therewith and connected to the ends of adjacent sections, a pin delivery station, means for driving said pin carrier intermittently in a closed path and locating each of said pin cups in succession at said pin delivery station, a plurality of intermediate stations to which said cups are moved by said carrier, means for delivering pins in succession to successive cups at said delivery station, movably mounted support means associated with each cup for releasably supporting a pin therein, fixed stops at each of said intermediate stations, a movably mounted stop at said delivery station, differently positioned trip elements for each of said cups, each of said elements having means mounting it on its respective cup so as to pass all of said fixed stops except the stop associated with a corresponding intermediate station, the trip element carried by the last cup to be filled being adapted to coact with said movably mounted stop, means normally holding said movably mounted stop out of the path of travel of said loaded cups passing through said delivery station, a device for moving said movably mounted stop into operative position for engagement with said trip element on said last cup to be filled with a pin, and means operative after the delivery of a pin into the last empty cup to be loaded and in response to the movement of said pin carrier to engage said trip elements with their respective fixed stops and said movably mounted stop to move said trip elements and release said releasable pin supporting means for discharge of said pins from said cups.

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