May 24, 1955 W. F. HUCK 2,709,083

PIN SETTING APPARATUS FOR BOWLING ALLEYS

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FIG. 5

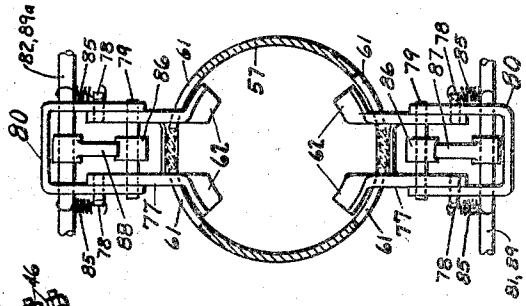
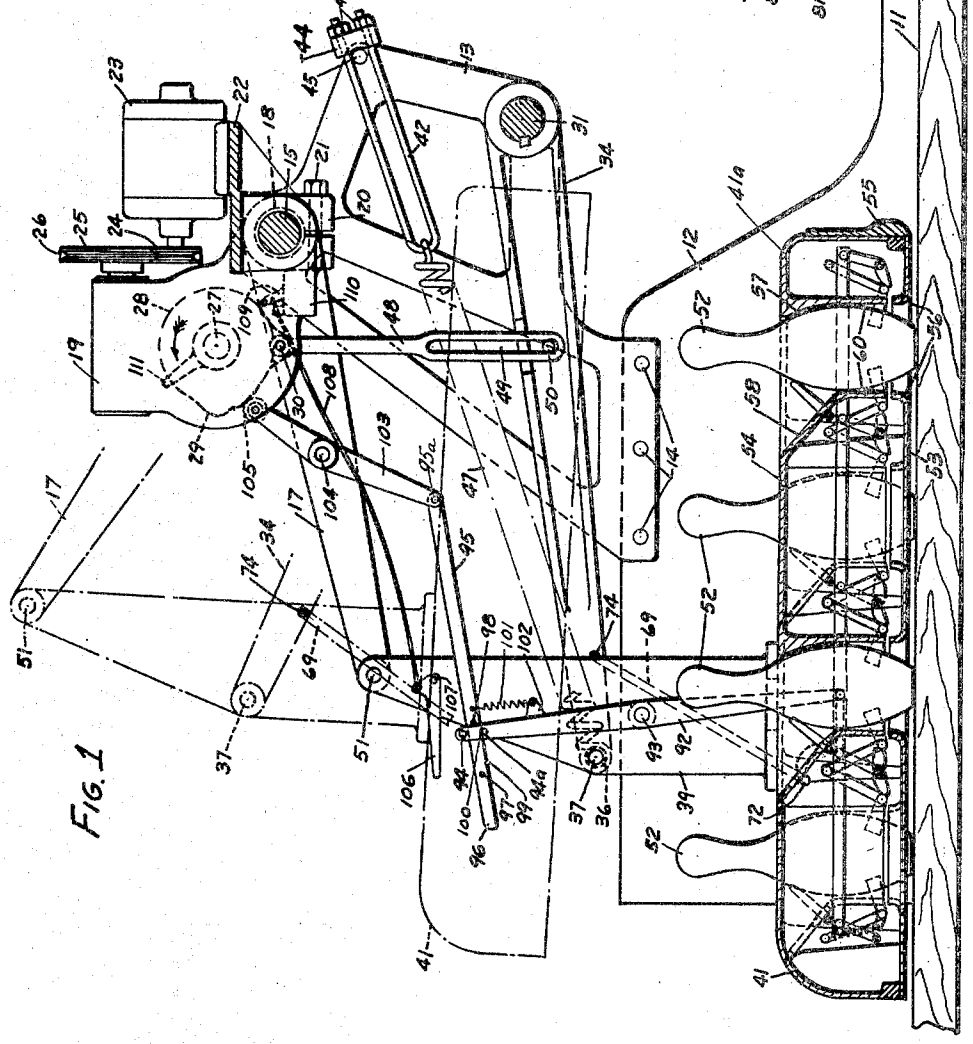


FIG. 1



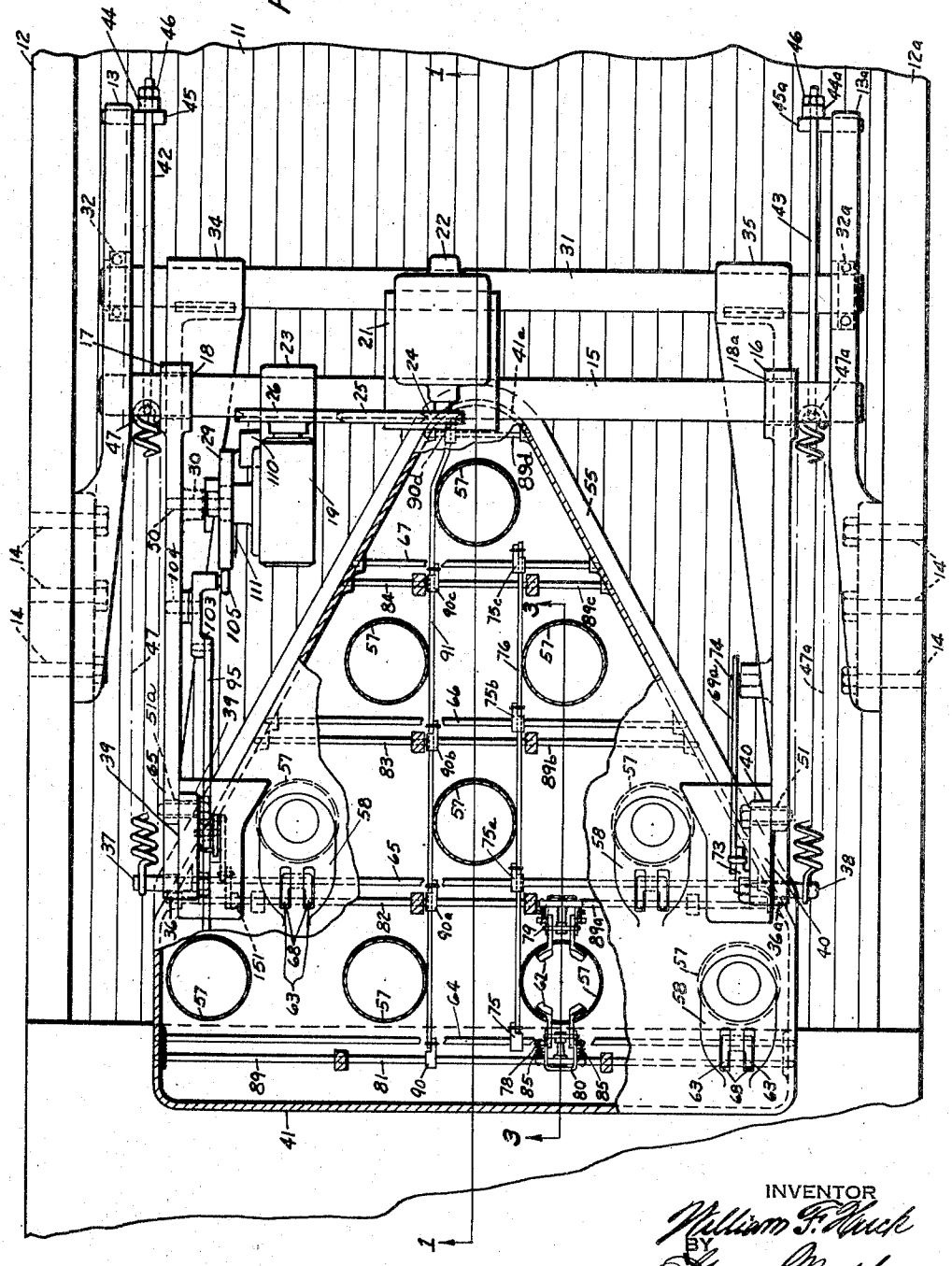
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PIN SETTING APPARATUS FOR BOWLING ALLEYS

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FIG. 2



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PIN SETTING APPARATUS FOR BOWLING ALLEYS

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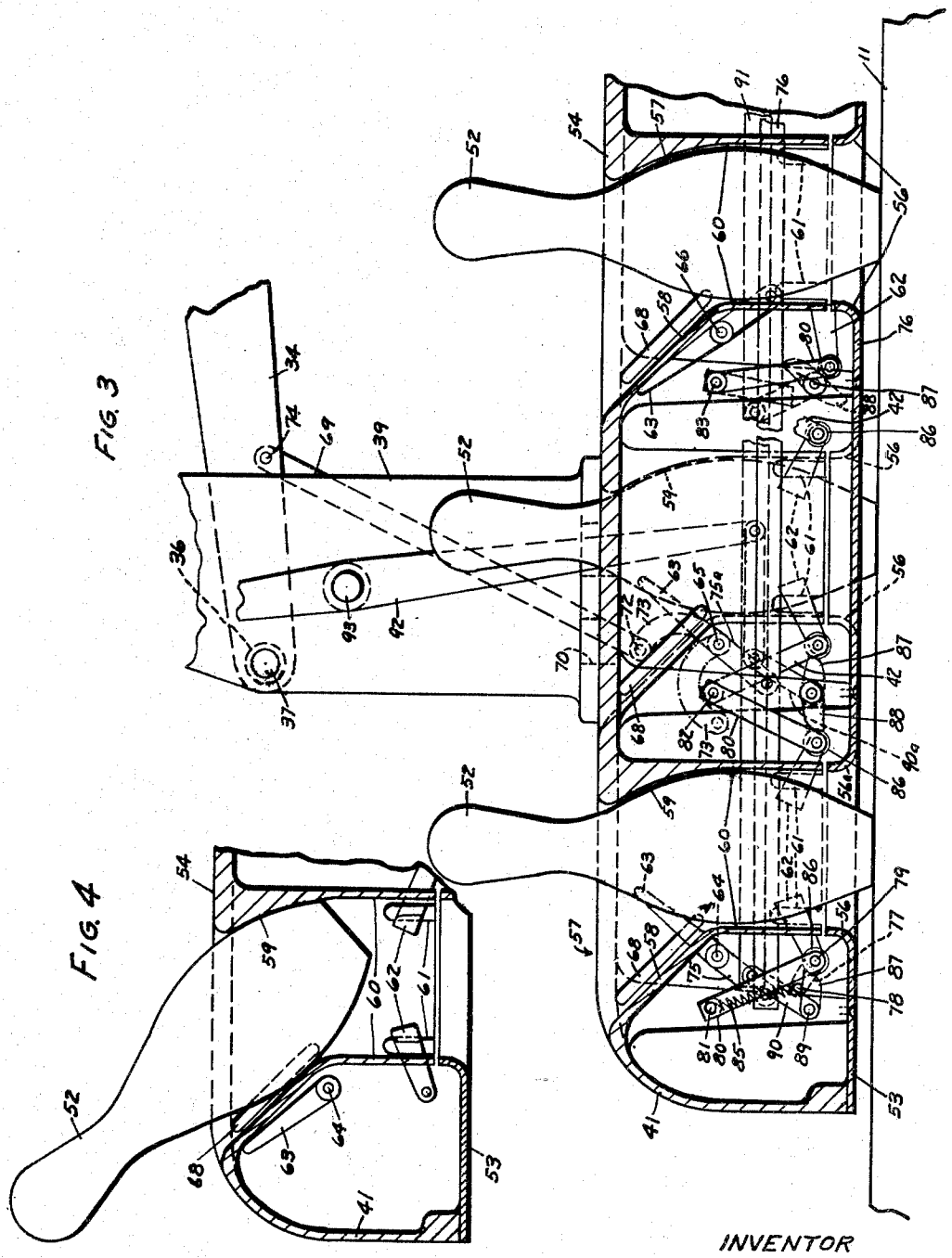


FIG. 3

FIG. 4

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PIN SETTING APPARATUS FOR BOWLING ALLEYS

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Application May 7, 1949, Serial No. 92,023

12 Claims. (Cl. 273—42)

This invention relates in general to the game of bowling and more particularly to apparatus for setting the bowling pins in playing position on the bowling alley.

The principal object of the invention is the provision of a device that may be quickly applied to a conventional type of bowling alley as a permanent adjunct thereto, and that will be effective to automatically and accurately replace the fallen bowling pins in a predetermined, invariable playing position on the alley after the said pins have been manually loaded into the device.

Another object of the invention is to provide improved means in the form of a compact assembly that will not obstruct or impede the normal playing of the game while assuring the accurate spotting of the bowling pins on the alley, and which will also safeguard the pins against injury when not in use.

A further object of the invention is the provision of a device detachably securable to practically any standard type of bowling alley, and that will afford time-saving means in the way of a semi-automatic handling of the pins after each play has been made; and that will obviate certain disadvantages in existing automatic pin-setting apparatus that are at once noisy in operation, of cumbersome and heavy construction, and which cannot be relied upon to always set the pins in the same spotting positions.

An additional object is to provide an efficient pin-setting mechanism having a housing adapted to protect all working parts against injury and to safeguard the bowling pins therein at the same time.

The invention contemplates a semi-automatic device which readily lends itself to immediate attachment to a standard bowling alley, and which is designed and adapted not to interfere with the normal functions of the pin boy in the way of overhead obstructions, while assisting him by setting the pins on the alley automatically in an invariable accurate playing position.

In accordance with this invention, after the bowling pins have been knocked down, the attendant merely thrusts them into the openings of the pin carrier member, and then pulls a switch to thereby operate the carrier member to automatically align the pins in vertical position and deposit them, through the intermediary of mechanism in the said pin carrier, on the alley in predetermined spots. The continued functioning of the device will next elevate the pin carrier over the alley in order to permit the customary playing procedure.

Additional objects and advantages residing in the novel design and construction and in the arrangement and disposition of parts will appear as the description proceeds, and will be best understood when taken in connection with the accompanying drawings wherein:

Figure 1 is a longitudinal, sectional view of an embodiment of the invention, taken on line 1—1 of Fig. 2, as seen in the direction of the arrows, certain parts being shown in elevation; and showing in full lines the pin carrier or assembly in the position it assumes in setting the pins on the bowling alley; and also showing in dash-dot lines the subsequent position of the said carrier over

the bowling alley preparatory to receiving manually the pins from the attendant;

Fig. 2 is a plan view of the apparatus, partly in section and with certain parts broken away for clarity of illustration, and with seven of the bowling pins omitted therefrom;

Fig. 3 is an enlarged, fragmentary, sectional view, taken on line 3—3 of Fig. 2, as seen in the direction of the arrows; and showing the bowling pins being located on the alley in correct spotting or playing position;

Fig. 4 is a fragmental, sectional detail view showing a bowling pin being received in a loading position; and

Fig. 5 is an enlarged detail view, partly in section, of one of the individual pin-engaging units on the main carrier member.

Referring now to the drawings wherein similar characters of reference indicate corresponding parts in the several views of the preferred form of the invention, the numeral 11 designates the floor or playing surface of a bowling alley to which is fastened, at the sides thereof, opposed partitions or "kickbacks" 12, 12*a*. These "kickbacks" are normally a part of the bowling alley construction, and serve as a support for a pair of frames or brackets of the present invention 13, 13*a* secured thereto in any suitable manner, as by the screws 14.

The frames 13, 13*a* are connected by a torsionally rigid tie rod 15 on which the adjacent ends of a pair of opposed arms 16, 17 are rotatably mounted, as by the bearings 18, 18*a*. The tie rod 15 also provides a support for a worm gear drive of conventional design, indicated generally at 19, that has the split socket extension 20 of its housing removably and clampingly secured thereon, as by the screw bolt 21. The tie rod 15, in addition, removably accommodates a motor platform or support, indicated generally at 22 and on which an electric motor 23 is fastened. The motor 23 has its pulley operatively connected to a pulley 25 of the worm gear drive 19 by a belt 26. The worm gear drive includes a shaft 27 to which a cam 28 having a bulge or prominence 29 and a crank pin 30, is secured in any suitable manner and at the predetermined position desired where it is effective to accomplish its functions, as hereinafter set forth more fully.

The opposed frames 13, 13*a* turnably support a torsionally rigid rock shaft 31 rotatable in bearings 32, 32*a* fixed on the same frames. A pair of lever arms 34, 35 keyed to the shaft 31 in spaced, parallel relation, have their outer ends apertured, as at 36, 36*a*, to accommodate pins 37, 38 fastened to brackets or frames 39, 40 that are rigidly secured to and form a part of a bowling pin carrier member or assembly, designated generally at 41. As hereinafter described in detail, the pin carrier 41 is designed and adapted to receive the bowling pins from the pin boy and then, upon actuation of a switch, to automatically align the said pins in vertical position and place them accurately on their spots on the playing alley; whereupon the carrier is automatically elevated to a position over the pins so that they may be engaged by the bowling balls without interference to the vision of the players.

The tie rod 15 and rock shaft 31 are positioned above the alley and in front of the carrier member 41 so that they do not interfere with the pit area immediately behind the alley bed. The arms 16 and 17 are shorter than the lever arms 34 and 35 and are so arranged that, although all the arms move in an arcuate path, the carrier member moves in a straight-line vertical path when immediately adjacent the alley so that the pins placed on the alley will not be disturbed by the carrier member.

The tie rod 15 and the rock shaft 31 are positioned on the frames 13, 13*a* so that the pairs of arms 16, 17 and

34, 35 extend substantially horizontal when the pin carrier member 41 is in its position adjacent the alley.

Means to counterbalance the weight of the carrier assembly 41 and facilitate its functioning are provided. These means include a pair of U-shaped bars or members 42, 43 having their outer threaded ends protruded through and retained in opposed relation by apertured blocks or bridge pieces 44, 44*a* respectively. A pair of pins 45, 45*a* projecting inwardly from the opposed frames 13, 13*a* respectively, are embraced by the legs of the U-shaped bars 42, 43 and are engaged against an adjacent portion of the bridge blocks 44, 44*a* that are urged thereagainst by the nuts 46 on the threaded ends of the said bars. A pair of tension springs 47, 47*a* have their right hand ends, as seen in Figs. 1 and 2, hooked over the adjacent loops of the U-shaped bars 42, 43 and their other ends engaged on the pins 37, 38 of brackets 39, 40. By turning the nuts 46, it will be understood the U-shaped bars may be bodily moved relatively to the bridge blocks 44, 44*a* and the attached frames 13, 13*a* whereby the tension of the coil springs 47, 47*a* may be adjusted to counterbalance the weight of the carrier member 41 to the degree desired, thereby facilitating the normal functioning of the device and easing the load on the motor 23.

The lifting and lowering of the pin carrier member 41 is effected through the intermediary of a lift rod 48 having its upper end turnably connected to the crank pin 30 mentioned above. An elongated slot 49 formed in the lift rod 48, accommodates a pin 50 fast to the lever arm 34. As illustrated in Figure 1, the pin 50 is located at the lower terminal of the slot 49 which is its normal position during the raising and lowering of the pin carrier member 41. Should, however, as hereinafter described, there be any obstruction preventing the lowering of the said platform to the position shown in full lines, then the slot 49 will permit the downward movement or reciprocation of the lift rod 48 without damage to the mechanism.

The means for assuring the horizontal alignment of the pin carrier member 41 in parallelism with the floor of the bowling alley at the time the bowling pins are to be deposited thereon, include the opposed arms 16, 17 mentioned above, that are swivelled on the bar 15 and have their left hand ends turnably mounted on pins or studs 51, 51*a* protruding inwardly from the reduced upper ends of the brackets 39, 40 on the carrier member.

As best shown in Figure 1, it will be understood that the coordinated action of the lifting lever arms 34, 35 and the upper guiding arms 16, 17 will be to swing the carrier member over the path shown and wherein its effective pin-depositing position will lie in parallelism with the alley floor. The attachment of the arms 16, 17 at the top of the brackets 39, 40 serves to prevent free swinging movement of the carrier member about the pins 37, 38 on the said brackets which would obviously otherwise occur during its raising and lowering movements. As illustrated in Figs. 1 and 3, the bowling pins 52 are in position to be released from the carrier member 41 and onto their spots on the floor of the bowling alley.

The pin carrier member or platform assembly 41 comprises a housing-like structure of a somewhat triangular configuration, as viewed in plan (Figure 2), and has an upper body or cover portion 54 and a bottom portion or plate 53. The front end 41*a* of this pin carrier 41 is protected by a rubber bumper, as at 55, to prevent possible damage from a bowling ball.

The bottom portion or plate 53 of the carrier is formed with a series of ten holes or openings, as at 56, which are arranged in the staggered or triangular relation illustrated, and in substantially the same spaced relation as the normal setting of the bowling pins on the floor of the bowling alley. In order to prevent any scratching or unnecessary marring of the surface of the bowling pins, these openings 56 are smoothly flared inwardly, as at 56*a*, where they communicate with the exterior of the bottom plate 53, thus providing an arcuately flared cylindrical surface.

The body or cover portion 54 of the pin carrier member 41 is secured to the bottom plate 53 in any suitable manner, and is provided in its upper surface with a series of ten openings, as at 57, arranged in staggered or triangular relation, similarly to the positioning of the openings 56 in the bottom plate 53. As best shown in Figures 3 and 4, each of these openings 57 has an inclined surface, as at 58; an approximately opposite arcuate surface, as at 59, and a cylindrical surface, as at 60, the latter merging with and into the aforesaid inclined and arcuate surfaces 58 and 59. The cylindrical openings or surfaces 60 are in alignment with the openings 56 of the bottom plate 53. Each of these cylindrical surfaces 60 of the openings 57 has four slots, as at 61 (Figs. 3 and 4), through which pass holding fingers 62 against which the bowling pins 52 come to rest as they slide down the inclined surfaces 58 after they have been initially inserted in the upper part of the openings 57.

Pairs of other fingers, designated generally at 63, secured on a series of rock shafts 64, 65, 66 and 67 having their ends turnably mounted in opposite sides of the body portion 54 of the carrier member 41, pass through slots 68 in the inclined surfaces 58 of the openings 57 in order to contact the bowling pins 52 as the pin carrier is lowered, thereby bringing the said pins into vertical position by forcing them against the form-fitting contour of the arcuate surfaces 59.

The actuation of the series of rock shafts 64, 65, 66 and 67 and consequently of the upper fingers 63, is effected in the following manner: A link 69 protruded through an opening 70 in the base of the bracket 39 and thence through an adjacent hole in the cover or top 54 of the carrier member 41, has its lower end hinged on a pin 72 fast to an arcuately-shaped lever 73 that is secured to the shaft 65 of the series of four rock shafts 64, 65, 66 and 67 mentioned above, that extend across the carrier member. The upper end of the link 69 is turnably mounted on a second pin 74 fastened to the lever arm 34. A second link 69*a*, similar to link 69, is passed through an opening in the base of the other bracket 40, and is correspondingly connected to an arcuately-shaped lever 73 on the shaft 65, it being understood that the disposition and functioning of parts with respect to the link 69*a* and its connections to the carrier member and the lever arm 40 is, in large measure, a duplicate of the mechanical tieup of the link 69.

An arm 75*a* secured to the rock shaft 65, is interconnected with a plurality of similar arms 75, 75*b*, 75*c* on the other rock shafts 64, 66 and 67 respectively and through the intermediary of a longitudinally extending link 76 joining the said arms. As will appear hereinafter, when the lever arms 34, 35 swing upwardly as the lift rod 48 ascends to raise the pin carrier member 41, all of the rock shafts 64, 65, 66 and 67 with their respective fingers will be oscillated in unison.

When the carrier member 41 is in its raised position, all of the pairs of upper fingers 63 will be below the inclined surfaces 58 so that the bowling pins may slide down easily into a nearly vertical position. As the carrier member moves downwardly, the fingers 63 will swing clockwise and press against the bowling pins 52 to aid, in coaction with the lower fingers 62 on their lower portions and with the form-fitting arcuate surfaces 59 against their upper portions, in holding them in exactly vertical position.

The lower pin-holding fingers 62 have extensions 77 with laterally projecting studs or pins 78 secured thereon, the said extensions being rockably mounted on other pins 79 arranged transversely in U-shaped members or links 80 which individually swing freely on shafts 81, 82, 83 and 84 that have their ends secured in opposite sides of the pin carrier member 41. The pins 78 serve as abutments to the U-shaped members 80 to limit the

downward movement of the fingers **62** about their axis pins **79**, and also serve as means to engage the adjacent hooked ends of tension springs **85**, the other ends of which are secured to the aforesaid shafts **81**, **82**, **83** and **84**. As best shown in Fig. 3, it will be understood that the effect of the springs **85** is to maintain the holding fingers **62** yieldingly in the position shown, by way of example. The pins **79** are provided with rollers **86** engaged by cams **87**, **88** fastened to shafts **89**, **89***a*, **89***b* and **89***c* that have their opposite ends turnably mounted in the sides of the carrier.

The shafts **89** and **89***d*, it will be observed, are provided with the cams **87**, **88** respectively; while the shafts **89***a*, **89***b* and **89***c* are each provided with a pair of the cams **87**, **88**. Each of the shafts has an attached lever arm **90**, **90***a*, **90***b*, **90***c* and **90***d* respectively, these lever arms being hinged to and interconnected by a longitudinally-extending link **91** which, in turn, is hinged to a vertically-extending link or arm **92** rockably mounted on a pin **93** in the bracket **39**.

The rock arm **92**, at its upper end, is provided with two studs or pins **94**, **94***a* arranged in spaced relation and between which a link **95** is engaged. The link **95** has a handle extension, as at **96**, and two spaced pins **97**, **98** that confine the movement of the link **95** relatively to the rock arm **92** in an approximately horizontal plane. A pair of notches **99**, **100** are provided on the lower edge of the link **95**, either of which may be selectively engaged by the lower stud **94***a* in order to impart angular movement to the rock arm **92**, as hereinafter described. A tension spring **101** having one end fastened to a lug **102** on the rock arm **92**, and its other end secured to an adjacent portion of the link **95**, tends to urge the stud **94***a* into operative engagement with either of the notches **99**, **100** until disengaged by manual operation of the lever or link **95**.

The link **95** is hinged, as at **95***a*, to the lower end of a cam-actuated rock arm **103**, turnably mounted on a fulcrum pin **104** protruding from the arm **17** on the tie rod **15**. The upper end of the cam lever **103** is provided with a cam roller **105** operatively engaged and coacting with the periphery of the cam **28**, whereby rotation of the latter via the worm drive **19** and its attached motor **23** will effect a rocking movement of the cam lever arm **103** and the connected series of links and shafts to effect the functions in part indicated in the foregoing paragraphs. While the cam **28** is turning, the crank pin **30** and its attached lift rod **48** will also function to raise the carrier member **41** via the lever arms **34**, **35** and their attached components.

A hand lever **106** pivoted on a fulcrum pin **107** fast to the bracket **39**, is connected by a rod or cable **108** to the operating arm **109** of a snap-switch **110** mounted on the socket extension **20** of the worm gear drive **19**. The snap-switch **110** is used to selectively make or break the electric circuit (not shown) energizing the motor **23**. The arm **109** of the snap-switch **110** is adapted to be engaged and tripped by a finger **111** attached to the cam **28**, thereby automatically deenergizing the motor **23** after each revolution of the cam shaft and with the carrier member in the upper or raised position after having deposited the bowling pins on the bowling alley.

The function and mode of operation of the device have been in part indicated in the foregoing paragraphs, but may be summarized as follows:

Assuming the pin carrier member **41** to be in the upper position indicated by the dash-dot lines in Figure 1, the bowling pins **52** are placed manually into the openings **57** where they preliminarily contact the inclined surfaces **58**, and slide diagonally and vertically downwardly into the holes **56** where they come to rest against the lower holding fingers **62** that, at this time, are extended inwardly through the slots **61**. The pin boy will now initiate the pin-setting operation by moving the small hand lever **106** to trip the switch **110** and thereby energize the electric motor **23** that, in turn, via the worm gear drive **19**, rotates the cam **28** in a counterclockwise direction. In the normal loading position illustrated in Figure 1, this will cause the descent of the lift rod **48** which allows the downward swing of the lever arms **34**, **35** and thereby the lowering of the carrier member **41** by gravity to the floor of the bowling alley, as shown in full lines in the same figure. While this action is taking place, the pairs of upper fingers **63**, through the intermediary of the rock shafts **64**, **65**, **66** and **67**; links **69**, **69***a* and arcuate levers **73** hinged to the series of the four rock shafts mentioned, will be turned in a clockwise direction to engage and accurately align the bowling pins in a vertical position.

As the crank pin **30** approaches its lowermost position, the cam **28**, via the cam roller **105** and rock arm **103**, will actuate the interconnected links **95**, **92** and **91**. The link **91** will move the attached lever arms **90**, **90***a*, **90***b*, **90***c* and **90***d* to rock the attached shafts **89**, **89***a*, **89***b*, **89***c* and **89***d* that have the cams **87**, **88**. The cams **87**, **88** while turning in a counterclockwise direction, as indicated on the right of Fig. 3, will allow the lower fingers **62** to retract through the slots **61** and permit the bowling pins to come to rest on their spots on the alley.

Further revolution of the crank pin **30** will cause the lifting of the pin-carrier member **41** to the position indicated by the dash-dot lines in Figure 1. This last mentioned movement will effect the retraction of the upper fingers **63** to a position below the slots **68** in the inclined surfaces **58**. The action of the bulge **29** on the cam **28** will keep the lower fingers **62** retracted until they have passed over the bowling pins, after which they will close in through the openings **61** to receive the next pins **52** as they fall. The opening and closing of the lower pin-holding fingers **62** is accomplished by means of the cams **87**, **88** on the shafts **89**, **89***a*, **89***b*, **89***c* and **89***d* by means of the levers **90**, **90***a*, **90***b*, **90***c*, and **90***d*, lever **92**, link **95** and lever **103** having cam roller **105** in engagement with cam **28**.

The making of the electric circuit to the motor **23**, as indicated above, is effected by the hand lever **106**, manipulation of which will move the cable **108** and consequently the attached arm **109** of the snap-switch **110**. The finger **111** on the cam **28** is adapted to contact the arm **109** and trip it after the said cam has made one revolution, thereby breaking the electric circuit. In this manner, the carrier member **41** starts from its top position by manual operation of the hand lever **106**, moves downwardly to set the pins **52** in vertical position and release them on the alley floor when the said carrier member is at its lowermost position, and then returns to its original upper starting position without interruption until the electric circuit is broken.

If desired, the arm **95** may be lifted manually and to the right so that the notch **99** will be engaged with pin **94***a* of lever **92**. In this position, the cam roller **105** on lever **103** will not be engaged by cam **28** while the carrier member is in the down position, and the pins **52** consequently will not be released. As a further consequence to this last described setting of the arm **95**, if the bowling pins have been set on the alley, the carrier member will pass over the said pins and the lower fingers **62** will slide freely over their top portions to engage them at their lower portions and lift them off the floor as the carrier again rises.

It may be pointed out that the cams **87**, **88** will not transmit the reaction of the bowling pin load into the shafts **89**, **89***a*, **89***b*, **89***c* and **89***d* in torque, except when releasing. It is also to be noted that the counterbalancing springs **47**, **47***a* whose predetermined tension may be adjusted by the U-shaped bars **42**, **43** function to maintain a practically constant counterbalancing action since their effective leverage increases as the carrier rises although their actual tension decreases during this movement.

In addition to the means provided for assuring the rigid

supporting of the frame members carrying the elevating mechanism for the carrier in all positions thereof, and particularly during the pin-lifting and depositing operations of the carrier, the carrier itself not only safeguards the bowling pins from injury by the apparatus, but also protects nearly all of its own mechanism from injury by flying pins and inadvertently rolled balls by means of its protective housing.

It is to be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

What I claim is:

1. In a device of the kind described and for use on a bowling alley, a bowling-pin carrier member having socket means to accommodate bowling pins, means including form-fitting surfaces in the socket means to guide bowling pins to a vertical position therein, a plurality of fingers movably arranged in the carrier member and effective to engage only arcuate portions of the bowling pins in the socket means and urge them into a vertical position and against other fingers in the carrier member, said last-mentioned fingers being effective to support and release the bowling pins at predetermined times, and a plurality of power operated elements mechanically connected to the fingers and operative to move the fingers to release the bowling pins onto the bowling alley.

2. In a bowling pin setting apparatus of the kind described and for use on a bowling alley, a bowling pin carrier, a carrier supporting and guiding mechanism connected to the bowling alley and maintaining the carrier over the said alley, means on the carrier to receive and guide bowling pins into a vertical position and against movable supporting elements, said elements being engageable only with top and bottom arcuate portions of the bowling pins, a plurality of instrumentalities operatively hinged to the supporting elements, one of said instrumentalities being manually adjustable and effective to render the supporting elements selectively operative and inoperative, and other means connected to the said mechanism and effective to maintain an idling action thereof when obstructions on the alley prevent lowering of the bowling pin carrier.

3. In a pin-setting apparatus of the kind described and for use on a bowling alley, a plurality of frames securable to the bowling alley and in opposed parallel relation thereon, means to maintain rigid alignment of the said frames and including a transversely extending bracing element connecting the frames, oscillating levers fulcrumed on said element as an axis and hingedly connected to a pin carrier assembly, a second element turnably mounted in bearings arranged in the frames, said second element having a plurality of levers connected thereto, said last mentioned levers having a hinged connection to the carrier assembly, power operated means supported on the first mentioned element, means including a cam connecting the power operated means to the plurality of levers on the second element, pin-engaging fingers mechanically connected to the carrier assembly and operable by the levers connected to the second element, other pin-engaging fingers connected by links to said cam, and switch means to selectively initiate and stop the operation of the power operated means.

4. In pin-setting apparatus of the kind described and for use on a bowling alley, frame members fastened to the bowling alley, a bowling pin carrier, a plurality of levers secured to the carrier and connected by a shaft oscillatingly mounted in and arranged transversely to the frame members, a second shaft arranged transversely in the frame members and serving as a support for levers freely oscillatable and attached to the carrier, said shafts being positioned in front of the carrier and above the bowling alley and effective to raise and lower the carrier and locate the carrier into parallelism with the surface of the bowling alley when in its lowered position and means operable when the carrier is in its lowered position to release bowling pins onto the alley.

5. In pin setting apparatus of the kind described and for use on a bowling alley, a carrier member, means on the member to receive bowling pins while the said pins are in an inclined position, other means on the carrier to slide the pins into a vertical position, instrumentalities to hold the bowling pins in vertical position, levers arranged to oscillate about axes located transversely to the bowling alley and in front of the carrier member, said levers affording unobstructed access to the carrier member while it is moving in a vertical direction and then maintaining the carrier member in parallelism with the bowling alley when the said member is depositing bowling pins thereon.

6. A bowling pin setting mechanism for use in a bowling alley, comprising, a supporting framework, a horizontally disposed carrier member movable between upper and lower positions and in a substantially vertical straight line when adjacent its lower position, two pairs of arms each pivotally mounted at one of their ends on said framework above the alley and in front of the carrier member and each pivotally connected to the carrier member at the other ends thereof, the pivotal connections for said pairs of arms to the framework being positioned so that the pairs of arms extend substantially horizontal when the carrier member is in its lower position, a plurality of pivotally mounted pin engaging means carried on said carrier member, interconnecting linkage between said plurality of pin engaging means to pivot said means in unison, a power driven control shaft located above the carrier member, means actuated by said shaft to raise and lower the carrier member, and means actuated by said shaft and including an arm pivoted on said carrier member for moving the interconnecting linkage to control said pin engaging means.

7. A bowling pin setting apparatus for use on a bowling alley having kickback partitions, a plurality of mounting frames secured to said partitions, a horizontally disposed bowling pin carrier movable between an upper pin-receiving position and a lower pin-setting position parallel with the bowling alley, a first pair of arms pivotally connected to said carrier and to said mounting frames at a position above the alley and in front of the carrier, a second pair of arms pivotally connected to said carrier and to said mounting frames at a position above the alley and in front of the carrier, the pivotal connection for said pairs of arms to the mounting frame being positioned so that the pairs of arms extend substantially horizontal when the pin carrier is in its pin-setting position to guide said carrier in a straight-line vertical path as the carrier approaches and moves away from the alley, socket means in the carrier adapted to receive bowling pins which are placed in the socket means at an angle from the vertical and having vertically extending arcuate surfaces shaped to fit the corresponding arcuate surfaces of the bowling pins, a plurality of fingers movably mounted on the carrier and engageable with top and bottom arcuate portions of the bowling pins positioned against the vertically extending arcuate surfaces of the socket means, certain of said fingers being operative to engage and move the pins to a vertical position, others of said fingers being operative to support the pins in the socket means and release the pins from the socket means when the carrier is in its position adjacent the alley, and means connected and effective to operate said certain fingers as the pin carrier descends to its pin-setting position and to move said other fingers to release the pins when the carrier is in its position adjacent the alley, said arms causing straight-line vertical movement of said carrier after pins have been deposited on the alley to prevent interference between the pins and

the socket means having the vertically extending arcuate surfaces.

8. A bowling pin setting apparatus as defined in claim 7 and including manually adjustable mechanism for selectively disconnecting the means for moving said other fingers as desired to permit passage of the carrier down over pins already positioned on the alley.

9. In a bowling pin setting apparatus of the kind described and for use on a bowling alley, a carrier member movable between an upper pin-receiving position and a lower pin-setting position, means for movably supporting said member, socket means arranged in the carrier member and formed to receive inclined bowling pins and subsequently vertically align and deposit the pins on the alley, a plurality of elements pivotally mounted on the carrier member and engageable only with arcuate top and bottom portions of the bowling pins in the socket means to move the pins into vertical alignment and hold the pins in said socket means, said elements being rockably supported on the carrier member, cam and lever means connected and operative to sequentially actuate the said elements to move the pins into vertical alignment and to then release the pins for downward movement in the socket means to a position in engagement with the alley when the carrier is in its lower position, electrically actuated means connected to and effective to operate the cam and lever means, and switch means connected to the electrically actuated means and operative to initiate and subsequently stop the operation of the electrically actuated means.

10. In a device of the kind described and for use on a bowling alley, a bowling pin carrier mounted for movement between an upper pin-receiving position and a lower pin-setting position, a plurality of sockets arranged on the carrier and having inclined surfaces and vertically arcuate surfaces, said inclined surfaces causing pins placed thereon to slide downwardly into engagement with said arcuate surfaces, said arcuate surfaces being adapted to coincide with corresponding arcuate surfaces on bowling pins and guide the pins to a vertical position, a plurality of fingers movably mounted on the carrier and engageable with lower arcuate portions of bowling pins to hold the pins in said sockets, a second plurality of fingers movably mounted on the carrier and engageable with upper arcuate portions of the bowling pins to move the pins into vertical position in said sockets, means connected to the carrier and to all of the fingers and effective to raise and lower the carrier and also to operate the fingers to vertically align the pins in the sockets as the carrier descends to pin-setting position and to release the pins for downward movement to effect the discharge of the bowling pins onto the bowling alley when the carrier is lowered, power operated means to actuate said first mentioned means, an electric circuit operatively actuating the power operated means, switch means associated with the electric circuit and operative to open and close it, and means for automatically tripping the switch means at a predetermined time to stop the movement of the power operated means.

11. In mechanism of the kind described and for use on the bowling alley, a bowling pin carrier, means for moving the carrier in a substantially straight-line vertical direction to avoid interference with pins set upon the alley bed and to a position parallel with the surface of the bowling alley when the carrier is in an effective pin-depositing position, said means including a torsionally rigid and oscillatably mounted cross member and also a second stationary cross member, both of said cross members being located in front of the carrier and lying transversely above and across the bowling alley and secured to bracket elements thereon, a pair of laterally spaced levers extended between said carrier and each of said cross members, one pair of levers being connected to said oscillatably mounted cross member, and power-operated means connected to one of said one pair of levers for raising and lowering said carrier, said cross members being positioned so that the pairs of levers extend substantially horizontal when the carrier is in pin-depositing position to cause substantially straight-line vertical movement of the carrier when in or near said position.

12. A bowling pin carrier member for pinsetting apparatus of the kind described and for use on a bowling alley, said member having openings shaped to receive and hold bowling pins in vertical positions, each of said openings being provided adjacent the top thereof with an inclined surface upon which a pin may be placed at an angle from the vertical, a vertically arcuate form-fitting surface opposite to each of said inclined surfaces positioned to engage the correspondingly arcuately fashioned surface of the bowling pins and in conjunction with said inclined surface to guide the pin into vertical position, said inclined surfaces causing pins placed thereon to slide downwardly into engagement with said arcuate surfaces, a plurality of fingers movably mounted on the carrier member and engageable with lower arcuate portions of bowling pins to hold the pins in said openings, a second plurality of fingers positioned oppositely to said vertically disposed arcuate surfaces and movably mounted on the carrier and engageable with upper arcuate portions of the bowling pins to move the pins into vertical positions in said openings, means for moving the carrier member toward and away from the alley, and means for moving the second plurality of fingers during the descent of the carrier member and the first plurality of fingers when the carrier member reaches a setting position adjacent the alley.

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