Aug. 4, 1942. F. J. MULLER 2,292,283

ELECTRIC BOWLING GAME APPARATUS

Filed June 3, 1940 3 Sheets-Sheet 1

Fig. 1

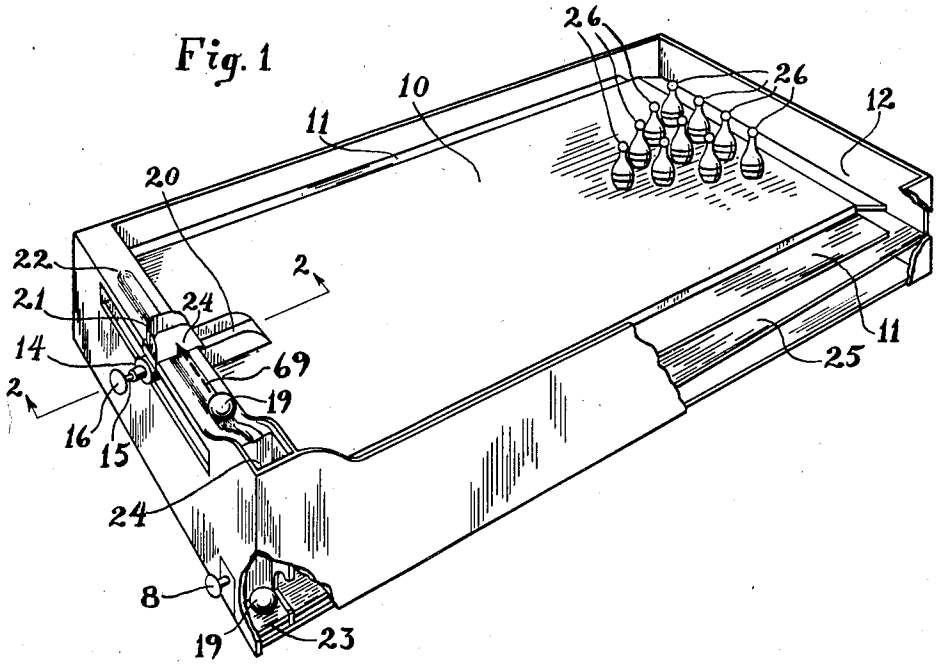
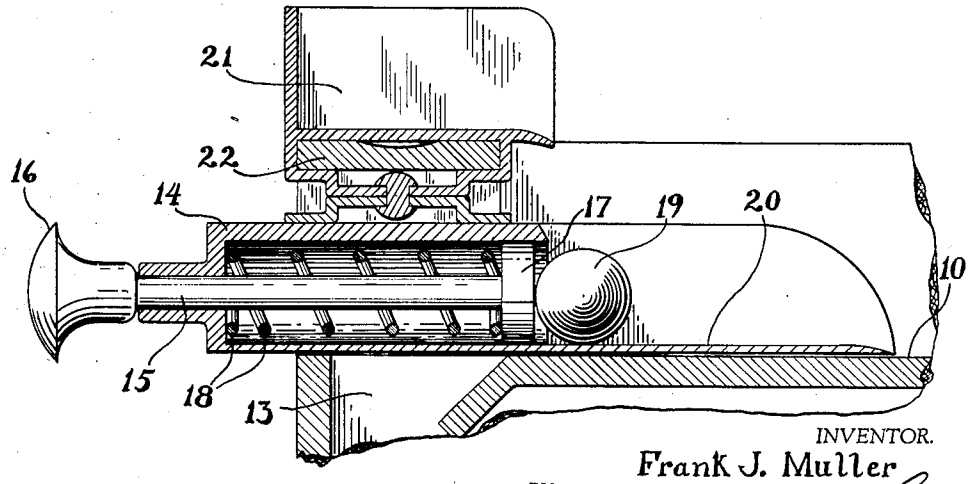


Fig. 2



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Fig. 3

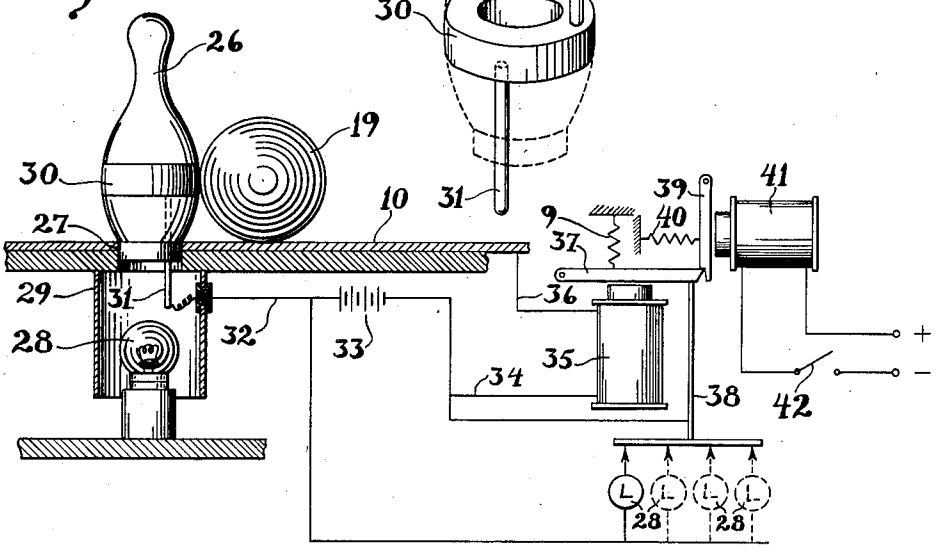


Fig. 4

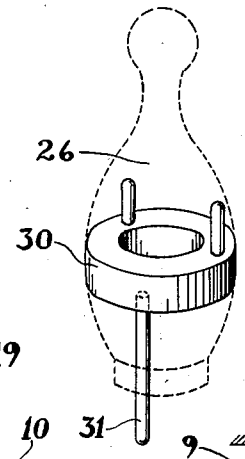
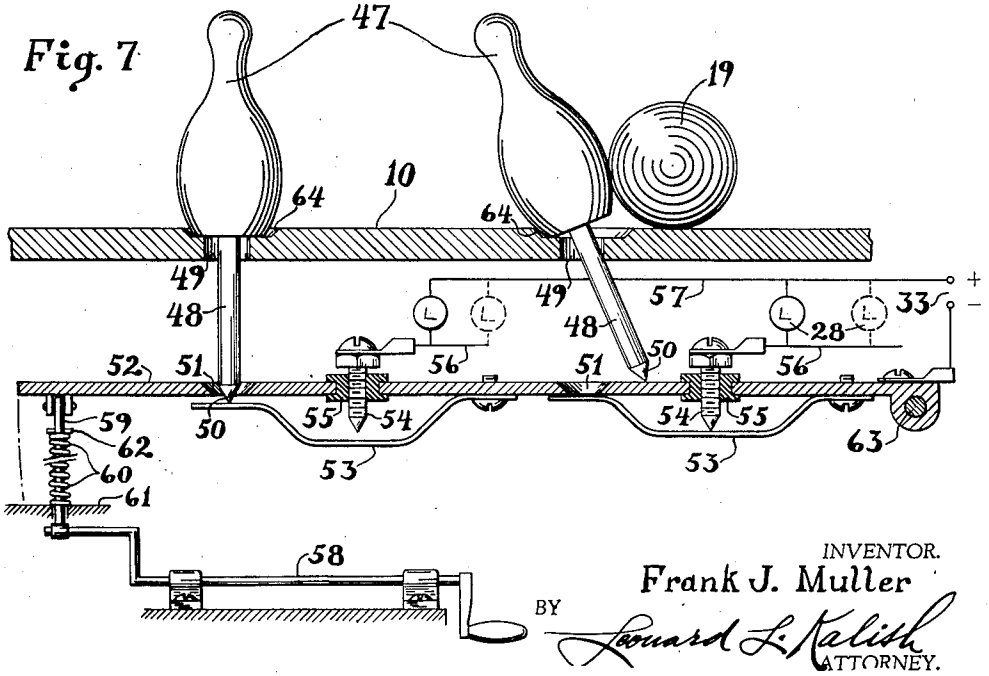


Fig. 7



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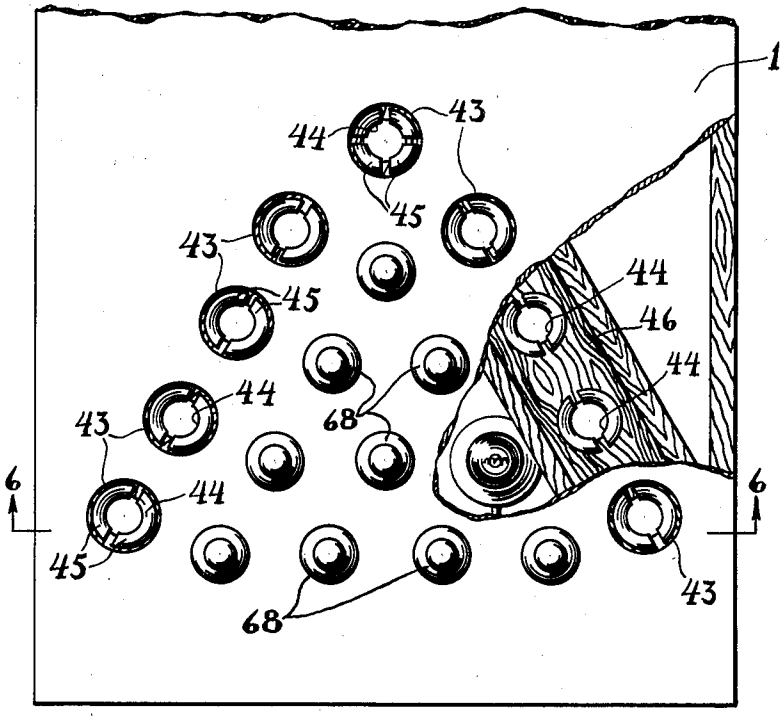


Fig. 5

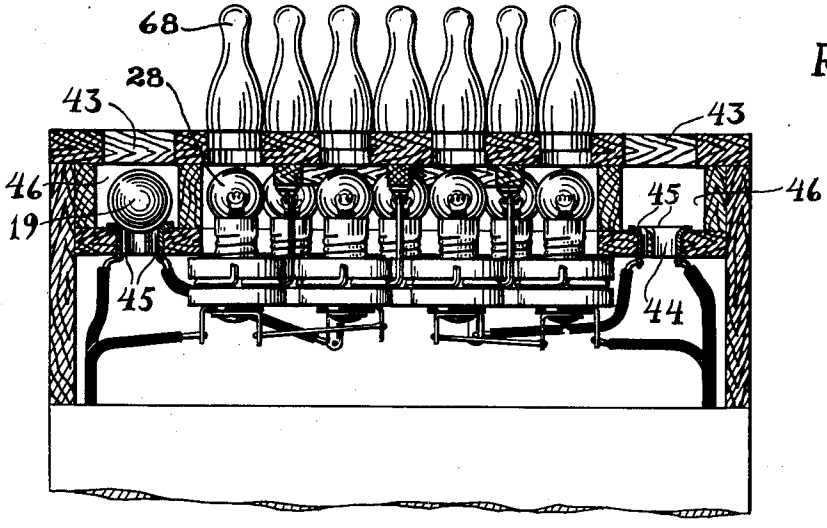


Fig. 6

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ELECTRIC BOWLING GAME APPARATUS

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Application June 3, 1940, Serial No. 338,574

5 Claims. (Cl. 273—37)

The present invention relates to game apparatus in general, and relates more particularly to electric bowling game apparatus for testing a player's bowling skill.

For the purpose of illustrating the invention, there is shown in the accompanying drawings forms thereof which are at present preferred, since the same have been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangements and organizations of the instrumentalities as herein shown and described.

In the accompanying drawings, wherein like reference characters indicate like parts,

Figure 1 represents a perspective view of a bowling game-apparatus constituting one illustrative embodiment of the present invention.

Figure 2 represents an enlarged sectional view taken on line 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 represents an enlarged view showing one of the tenpins in the foregoing apparatus being struck by a bowled ball, and diagrammatically showing the associated electrical circuits.

Figure 4 represents a perspective view of the electrical contact ring at the large diameter of the tenpin.

Figure 5 represents a fragmentary plan view showing the tenpin-end of the alley-bed of a modified embodiment of the present invention.

Figure 6 represents a transverse sectional view taken on line 6—6 of Figure 5, looking in the direction of the arrows.

Figure 7 represents a fragmentary longitudinal sectional view through another embodiment of the present invention.

In the particular embodiment of the present invention illustrated in Figures 1 to 4 inclusive, the apparatus includes a smooth alley-bed 10 of any suitable length and width, bounded along its opposite longitudinal edges by suitable gutters 11 which may be inclined away from the player thereby to deliver improperly directed or stray balls to the terminal pit 12 at the far end of the alley. The alley-bed 10 may, if desired, be inclined slightly towards the player so that feebly-projected balls will roll back to the player's end of the alley—where they may drop through a pit 13.

At the players end of the alley, a ball catapult or projector indicated generally by the numeral 14 may be provided for bowling the ball down the alley-bed, or if desired the balls may be directly manually bowled. The ball projector 14, where provided, may be of any suitable type, and may include a plunger-rod 15 provided with a manual graspable rear handle or knob 16 and bearing a ball-striking head 17 at its forward end. A helical compression spring 18, or any other suitable or equivalent rod-impelling means, may be interposed between the projector-housing and the plunger-rod, so that by retracting knob 16 to the desired extent and then suddenly releasing it, any desired speed (within the limits of the apparatus) may be imparted to the ball 19.

If desired, an open chute or directional apron 20 may be associated with the propulsion plunger 15 for directing the ball 19 once it has been set into motion by the plunger 15.

The ball-projector 14 may be swivellably connected with an overhead ball-guiding deflector member 21, which may be transversely slidable across the player's end of the alley on a ball-delivery runway 22. The projector 14 may thus be moved laterally across the width of the alley to any desired position, and may be manually pivoted or swivelled or moved angularly into any desired angular setting thereby to direct the ball 19 along any desired course down the alley-bed 10.

A ball-lifting platform 23, which may be vertically reciprocated by manually-actuable lever means 8 or otherwise, may be slidably disposed in a vertical well 24 at a corner of the bowling alley and extending intermediate the lower terminus of an inclined ball-return runway 25 and the upper end of the inclined ball-delivery runway 22, for the purpose of raising or lifting returned balls one at a time to a level sufficiently high for the ball to then roll in the direction of the arrow 69 along the inclined delivery runway 22 and against the deflector member 21, which then deflects the ball and causes it to drop down into the aiming chute or apron 20 in front of the plunger-rod 15.

At the opposite ends of the alley-bed 10, the ball may drop down through the terminal pits 12 or 13 and onto the inclined ball-return runway or chute 25 so arranged as to guide the balls back to the ball-lifting platform 23.

A set of tenpins 26 which are preferably formed of a light-transmitting synthetic organic material, as for instance of "Lucite" or of "Plexiglas," may be tightly or loosely set into or may rest over corresponding openings 27 in the alley-bed 10.

Immediately below these tenpins 26 may be disposed a plurality of incandescent electric lamps 28, whose light rays may be separately confined by suitable light shields or housings 29 surrounding the different alley-bed openings 27. In this manner, the light rays emitted by any one lamp 28 will strike the lower end of only the associated light-transmitting tenpin 26, thereby illuminating said tenpin and causing it to glow. The outer surfaces of the tenpins 26 may be roughened, so as to diffuse the light leaving said tenpins.

If desired, however, the tenpins may be constructed from any suitable opaque material, in which case they may be individually illuminated from without.

In either event, however, means are preferably provided for suddenly selectively illuminating, or in the alternative for suddenly selectively extinguishing the illumination on any one tenpin or group of tenpins (depending on whether the tenpins are normally unilluminated or illuminated), in accordance with the particular tenpins which have been struck by the bowled ball 19. Thus, for example as more particularly illustrated in Figure 3, the upper surface of the alley-bed area 10 immediately adjacent the tenpins 26, over which a ball 19 would have to roll in order to encounter the tenpins, may be made of metal, and each of the tenpins may be provided at its maximum diameter with a metallic electrical contact ring 30 (illustrated in perspective in Figure 4), which must be contacted by the bowled ball whenever the tenpin is struck, provided said ball is of proper size. In this fashion, the ball 19, which is made of metal, will complete an electrical circuit between the metal surface of the alley-bed 10 and the tenpin contact ring 30, and the completion of this circuit may be utilized, for example, selectively to light or extinguish any one or more lamps 28 corresponding with the tenpins which would ordinarily have been bowled over by said ball striking the group of tenpins in the manner in which it did. Thus, the contact ring 30 may have a downwardly-depending pin or lug 31 which may be connected through an electrical lead 32 to one side of any suitable source of electrical energy, as for instance the illustrated electric battery 33 or the secondary winding of an electric transformer or the like. The other terminal of the source of electrical energy 33 may be connected through the lead 34 to the winding of a relay electromagnet 35 whose opposite end may be connected through the lead 36 to the metal surface of the alley-bed 10. The relay electromagnet 35 may include a pivoted armature 37, normally pulled away from the core of the electromagnet by a spring 9. The movable armature 37 carries an electrical contact-member 38 which, as diagrammatically illustrated in Figure 3, is adapted to make or break an electrical circuit leading from an electric source of energy 33 through the tenpin-illuminating lamp or lamps 28 and back to said source 33. Thus, when the bowled ball 19 strikes a tenpin contact ring 30, it momentarily completes the electric circuit through the coil of the relay electromagnet 35, thereby momentarily energizing it causing it magnetically to attract the armature 37. The movement of this armature 37 is transmitted to the electric contact-member 38, which then closes the electrical circuit through the lamp or lamps 28. If desired, the resultant movement of armature 37 may be caused to open a theretofore closed circuit through said lamps, so as to extinguish the lamps.

The thus-closed (or opened) circuit through the lamps 28 may then be maintained by any suitable means, as for example by means of a spring-tensioned pivoted latch-bar 39 which is under the constant tension of a coiled spring 40, and which latch-bar may engage any suitable part of the armature 37, as for instance the end of said armature, when the latter has been momentarily magnetically attracted by the electromagnet 35.

The separate circuits controlled by the various tenpin contact rings 30 may include the particular electric lamps corresponding to those pins which would normally have been bowled over by the ball striking the set of standing tenpins in the manner in which it did. In this manner, these tenpins which would ordinarily have been bowled over by the bowled ball striking the group of tenpins in the manner in which it did will be illuminated (or darkened), and may remain illuminated (or darkened) until all the tenpins have been illuminated (or darkened) or until the player has used up his allotted number of balls.

A de-latching electromagnet 41 may then be momentarily energized by closing an electrical switch 42 to complete the electrical circuit between any suitable source of electrical energy, as for instance the battery 33, and said electromagnet 41 thereby to attract the latch-bar 39, causing it to release the armature 37 and permitting the armature-spring 9 to pivot it upwardly thereby breaking (or making) the circuit through the electric lamps 28 in preparation for the next game.

There may be as many electromagnets 35 provided as there are tenpins, or lamps, or if desired only the two outer rows of tenpins which face the player may have separate electromagnets associated therewith, or if desired electromagnets may be associated with any desired group or groups of tenpins. Also, a separate de-latching electromagnet 41 may be provided for each latch bar 39, or a single one may be provided for all the latch-bars. Furthermore, if desired, a single catch-type latch-bar 39 may be used in lieu of a plurality of individual latch-bars.

As the bowled balls may not actually contact all tenpins, and as indeed, some of the tenpins would ordinarily be bowled over by other pins falling upon them it may not be necessary to provide some of these tenpins, as for instance the inner tenpins with contact rings 30, and associated circuits. Such inner tenpins would however preferably have associated therewith electric lamps, controlled by the balls striking one or more outer tenpins, so that their illumination would vary with the score.

In the second embodiment of the present invention illustrated in Figures 5 and 6, the tenpins 68 do not have any contact rings, and instead the alley-bed 10 is provided with holes or depressions 43 disposed in front of the tenpins. In actual operation, the bowled ball 19 drops through the particular hole 43 associated with, or nearest, the tenpin towards which the ball was rolling, and seats itself on a submerged socket 44, one of which is disposed below each of said openings 43. These submerged sockets 44 may include two or more electrical contact members 45 normally insulated from each other, and adapted to be bridged or spanned by the metal ball 19. The contact members 45 are arranged

in different electrical circuits which include one or more of the pin-illuminating electric lamps 28 respectively disposed underneath the exposed bottoms of the tenpins 68. If desired, these contact members 45 may be arranged in electrical circuits of the kind illustrated in Figure 3, with the pair of contact members 45 replacing the contact elements 30 and 10 of Figure 3. Thus, the circuits which are adapted to be completed by the metal ball bridging the contact members 45 may include the source of electrical energy 33, a relay electromagnet 35 controlling a lamp-switch-closing armature 37 and contact member 38, said armature having associated therewith a latch-bar 39 adapted to be withdrawn, when desired, by the de-latching electromagnet 41, all as illustrated in Figure 3. In either event, however, the flow of electrical current through these circuits which include these contact members 45 will be controlled by the balls 19 falling onto the various sockets 44 and completing the circuits across the exposed contact members 45. At the end of each game or play the stalls 46 may be cleared of the ball or balls 19 resting in the sockets by any suitable means.

In the particular embodiment of the present invention illustrated in Figure 7, the tenpins 47 are each provided with a downwardly-depending stem 48 which extends through a suitable opening 49 in the alley-bed, and terminates at its lower end in a pointed tip 50 normally extending through a registering conical opening 51 in a pin-resetting plate 52. When the tenpin 47 is in its normal upright position, its lower tip 50 rests on an electrical leaf-spring contact member 53, fastened to the underside of the plate 52, holding it away from its cooperating adjustable contact member 54, which latter member may be mounted on the plate 52 and insulated therefrom by a rubber bushing 55 or the like.

When the tenpin 47 is struck by the bowled ball, it is tilted out of its vertical position, causing the lower tip 50 of the stem 48 to leave the conical hole 51, thus releasing the leaf-spring contact member 53, which thereupon snaps upwardly and establishes contact with the juxtaposed fixed contact member 54. The establishment of this contact may be utilized to light one or more tenpin-illuminating lamps 28, which may have their one side connected to the stationary contact member 54 through the electrical lead 56, and which may have their other side connected through the lead 57 to one of the terminals of a suitable source of electrical energy, as for example the battery 33, with the other terminal of said source being connected through the plate 52 with the leaf-spring contact member 53. If the plate 52 be made of some non-conducting material, the other terminal of said power source may be connected with the contact member 53 by a separate lead. The vertical reciprocations of this leaf-spring contact element 53 caused by the placement and displacement of the tenpins 47, will thus make and break the electrical circuit through the lamp 28.

The aperture 49 in the alley-bed may be dimensioned relative to the tenpin stem 48 as to limit the tilting range of the tenpin to stable positions of the tenpin, that is to say positions wherein the tenpins will seek to right themselves when permitted to do so. This self-righting feature whereby the tenpins will seek to return to the vertical after tilting may be achieved in other manners, as for instance by so proportioning the tenpins and their depending stems and by so distributing the weight therein as to cause the tenpins to tend to assume a vertical position pendulum-wise after they have been struck by the bowled ball.

When a tenpin has been properly struck by a bowled ball, the lower tip 50 of the tenpin stem 48 will be lifted out of the conical hole 51 and will then come to rest on the pin-resetting plate 52 in proximity to said hole, thereby holding the tenpin in tilted position. After the player has bowled a given number of balls, or after all or any given number of the tenpins have been tilted, the tenpins may all be quickly and easily automatically reset by merely first lowering and then raising the pin-resetting plate 52. This may be effected by any suitable mechanism as for instance by turning a crankshaft 58 through 180 degrees, thereby pulling down a connecting link 59 and simultaneously compressing a plate-returning compression-spring 60, whose lower end may rest against a fixed stop 61, and whose upper end may bear against a cross-pin 62 fixedly related to the connecting link 59. The upper end of this connecting link 59 is pivotally connected to the one end of the pin-resetting plate 52, whose opposite end portion may be pivotally supported on any suitable trunnion or pivot-pin 63.

Thus, when the crankshaft 59 has been rotated through 180 degrees, the pin-resetting plate 52 will be swung clear of the lower ends 50 of the tenpin stems 48, thereby permitting these stable tenpins to resume their vertical positions with their lower stem tips 50 being disposed directly over their corresponding plate apertures 51. The crankshaft 59 is then released, permitting the restoring spring 60 to swing the pin-resetting plate 52 back to its original position and simultaneously causing these stem tips 50 to enter and project through the plate apertures 51 and depress all the leaf-spring contact elements 53, thus preparing the apparatus for the next game.

If desired, the alley-bed apertures 49 may be encircled by upper outwardly-flared guide-surfaces 64 for guiding the self-righting tenpins into their proper positions relative to each other and for bringing them into accurate registration with the lower plate apertures 51.

If desired, a plurality of tenpin-illuminating lamps 28 may be jointly connected to a common contact-element 54, or a plurality of separate contact-elements 54 may be provided each connected with a different lamp 28 and each adapted for electrical contact with a common movable contact element 53, or with a plurality of such elements.

Each one of the tenpins 47 may be separately tiltable, or if desired any selected group, as for example the outside rows of tenpins facing the operator, may be tiltable with the remaining pins being fixedly secured to the alley-bed and having their scoring controlled by the tiltable pins in any desired predetermined manner.

These tenpins 47, like the tenpins 26 of the embodiment illustrated in Figures 1 to 4 inclusive, may be constructed of "Lucite" or "Plexiglas" or of any other suitable light-transmitting material, and preferably have their associated lamps 28 so situated as to illuminate said tenpins individually from below. However, it is to be expressly understood that the tenpins of any of the embodiments need not be constructed from light-transmitting material, and may if desired be constructed from opaque material, in which latter

case they may be separately illuminated from without by their associated lamps. Furthermore, if desired, the lamps **28** may be placed, or may be duplicated, at some remote location, as for example on a score board or the like.

In each of the foregoing embodiments, the striking of the same tenpin more than once will not increase the indicated score. Cumulative scoring is thus avoided, and the final score showing will accurately reflect the players ability or skill in striking all or any predetermined group of tenpins with the bowled balls.

The present 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 embodiments 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.

Having thus described the invention, what is hereby claimed as new and desired to be secured by Letters Patent is:

1. In bowling game apparatus of the character described, a generally flat metal plate, at least one tenpin formed from electrically non-conducting material extending above said plate and bearing an exposed electrical contact member insulated from said plate and adapted to be struck by a bowled ball, an electrical circuit extending intermediate said contact member and said metal plate, said circuit including a source of electrical energy, and a metal ball adapted to be bowled towards said metal plate, said ball being of suitable size to contact the tenpin contact member thereby electrically to connect at least momentarily said metal plate and said contact member to close the associated electrical circuit.

2. In electric bowling game apparatus of the character described, a tenpin formed from electrically non-conducting material, an annular metallic contact ring carried by said tenpin at its point of maximum diameter, and current-conducting means inside said tenpin extending downwardly from said contact ring and projecting below the base of said tenpin.

3. Bowling game apparatus including an alley bed formed at least in part of electrically conducting material, a set of ten-pins arranged in a triangualr arrangement with the apex pointing toward the player and so mounted upon said alley bed as not to be upset by the ball, each of said pins being light transmitting and having an electric light associated therewith for illuminating the same, each of the outside pins on the "V" facing the oncoming ball being mounted upon said electrically conducting material and having an electrical contact adapted to be contacted by the ball, a ball of electrically conducting material adapted to be rolled down the alley bed into contact with said electrical contacts of the pins thereby to close an electrical circuit between such contacts and the electrically conducting portion of the alley bed, an electrical circuit between said electrical conducting alley bed portion and each of said pin contacts, including a source of electrical energy, and an electro-magnet adapted to be energized momentarily upon the momentary closing of the corresponding pin-contact circuit by the ball, an armature for each of said electro-magnets adapted to be moved thereby when the electro-magnet is energized, a secondary electrical switch operated by said armature, a secondary electrical circuit in series with said electrical switch and with a source of electric current and with a corresponding electric light, a latch for holding each of said secondary electrical switches in the position into which the armature of the electro-magnet has set the same, after the electro-magnet has been deenergized, and means for releasing said latches at the will of the player.

4. Bowling game apparatus of the character described including a generally flat plate of electrically conducting material, a set of ten-pins arranged in a triangular arrangement with the apex pointing toward the player and immovably mounted upon said plate, said ten-pins being formed of light-transmitting and electrically non-conducting material, at least some of the peripherally disposed ten-pins having an exposed electrical contact member above the base thereof, and insulated from said plate, a ball of electrically conducting material adapted to be bowled towards said ten-pins, and being of suitable size simultaneously to contact said contact member and said metal plate, a plurality of electrical circuits intermediate said contact members and said metal plate, said electrical circuits including electric lights arranged to illuminate individual ten-pins from below, said ball being adapted momentarily to energize said electrical circuits upon contact with said contact members and with said plate thereby to control the illumination of said electric lights and to indicate the score.

5. Bowling game apparatus including an alley bed formed at least in part of electrically conducting material, a set of ten-pins arranged in a triangular arrangement with the apex pointing toward the player and immovably mounted upon said alley bed adjacent said electrically conducting portion, each of said ten-pins being formed of light-transmitting and electrically non-conducting material, at least some of the peripherally disposed ten-pins having an exposed electrical contact member insulated from the electrically conducting portion of said alley bed, a ball of electrically conducting material adapted to be bowled down the alley bed into simultaneous contact with said electrically conducting portion and said exposed contact members, a plurality of electrical circuits operatively connected between each of said exposed contact members and the electrically conducting portion of said alley bed, said electrical circuits including electric lights disposed beneath each of said ten-pins and adapted to illuminate individual ten-pins from below, said electrical circuits being adapted momentarily to be energized upon simultaneous contact of said ball with the electrically conducting portion of said alley bed and with said exposed contacts, and means associated with said electrical circuits for controlling the illumination of said electric lights and of said ten-pins whereby said degree of illumination will indicate the score.

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