

66 **E. K. MENTZER** 3,
HORIZONTALLY MOVABLE PIN DETECTING MEMBER WITH
SYNCHRONOUS SWITCHING SYSTEM FOR INDICATING
STANDING PINS

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April 26, 1966

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STANDING PINS

3,248,111

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Fig. 3.

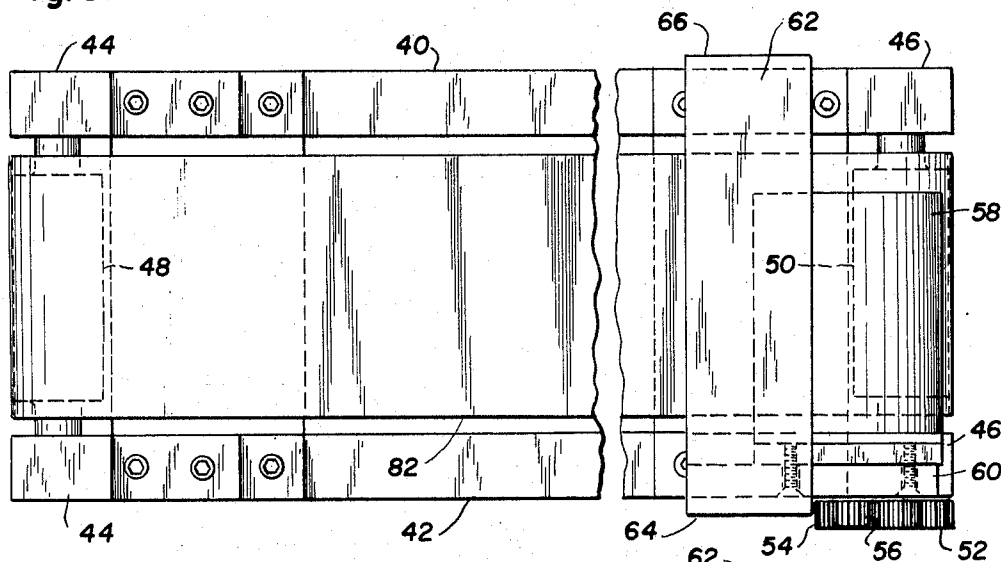


Fig. 2.

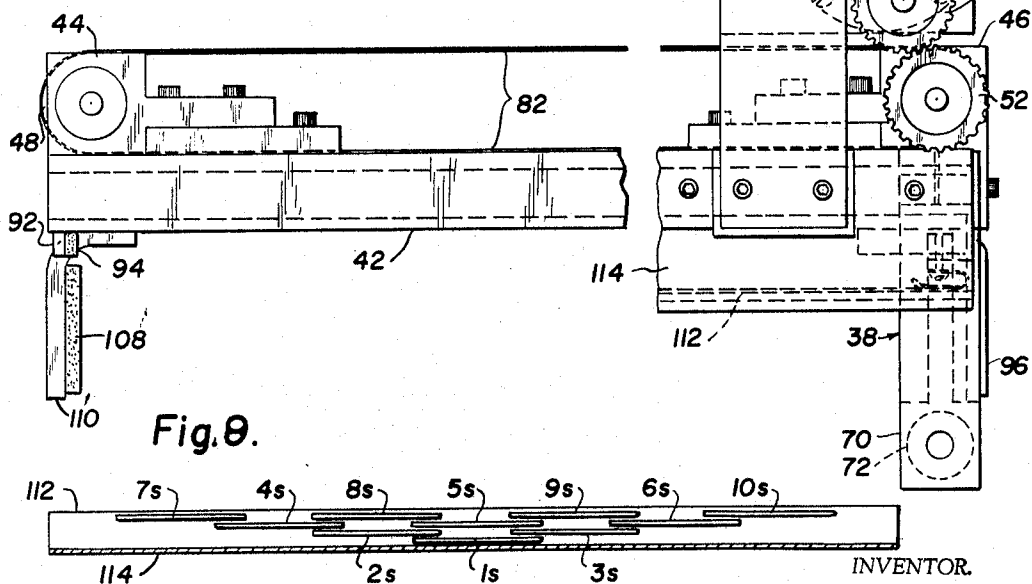
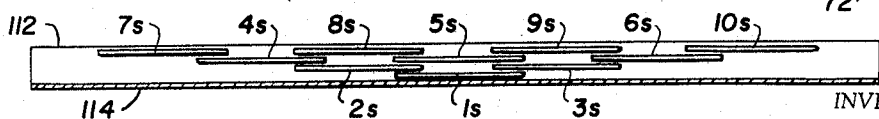


Fig. 9.



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Fig. 5.

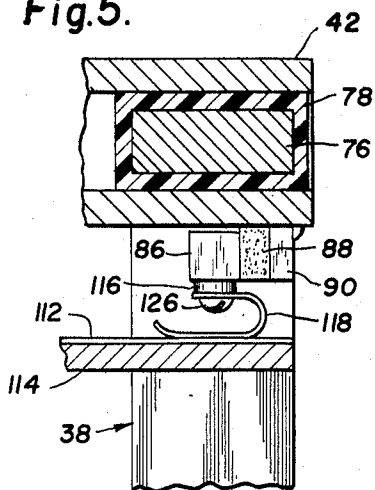


Fig. 6.

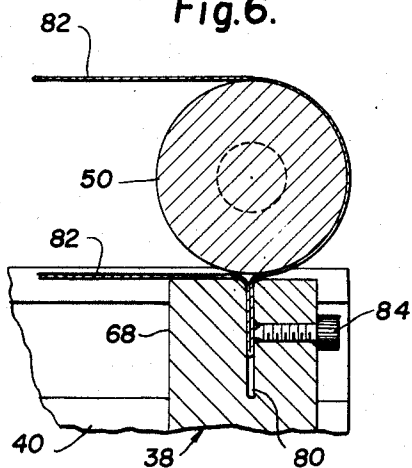
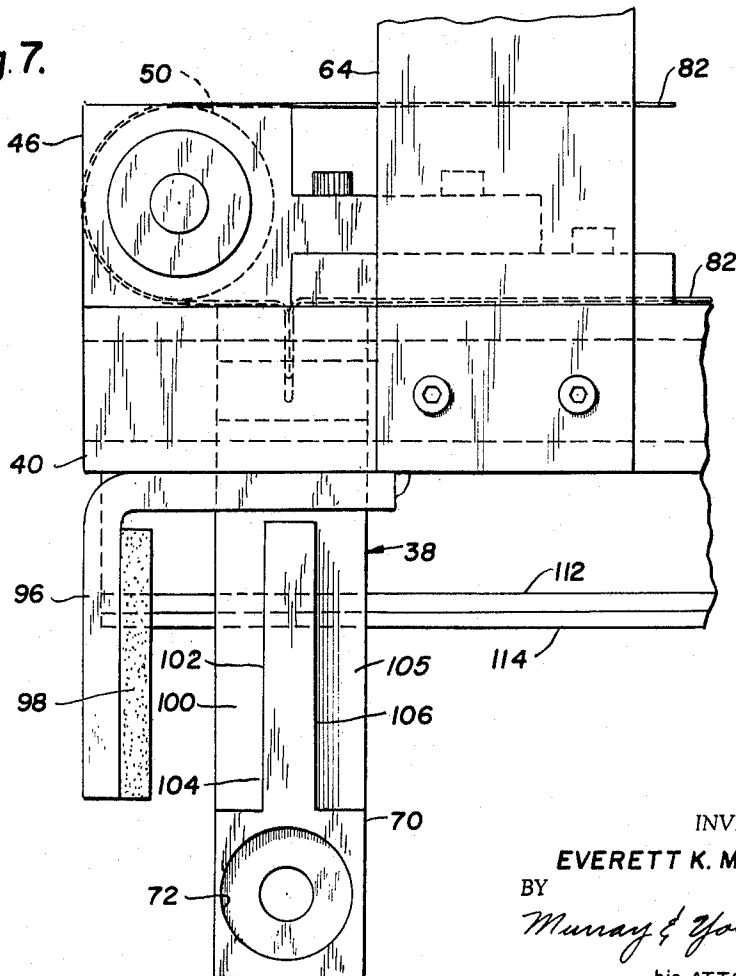


Fig. 7.



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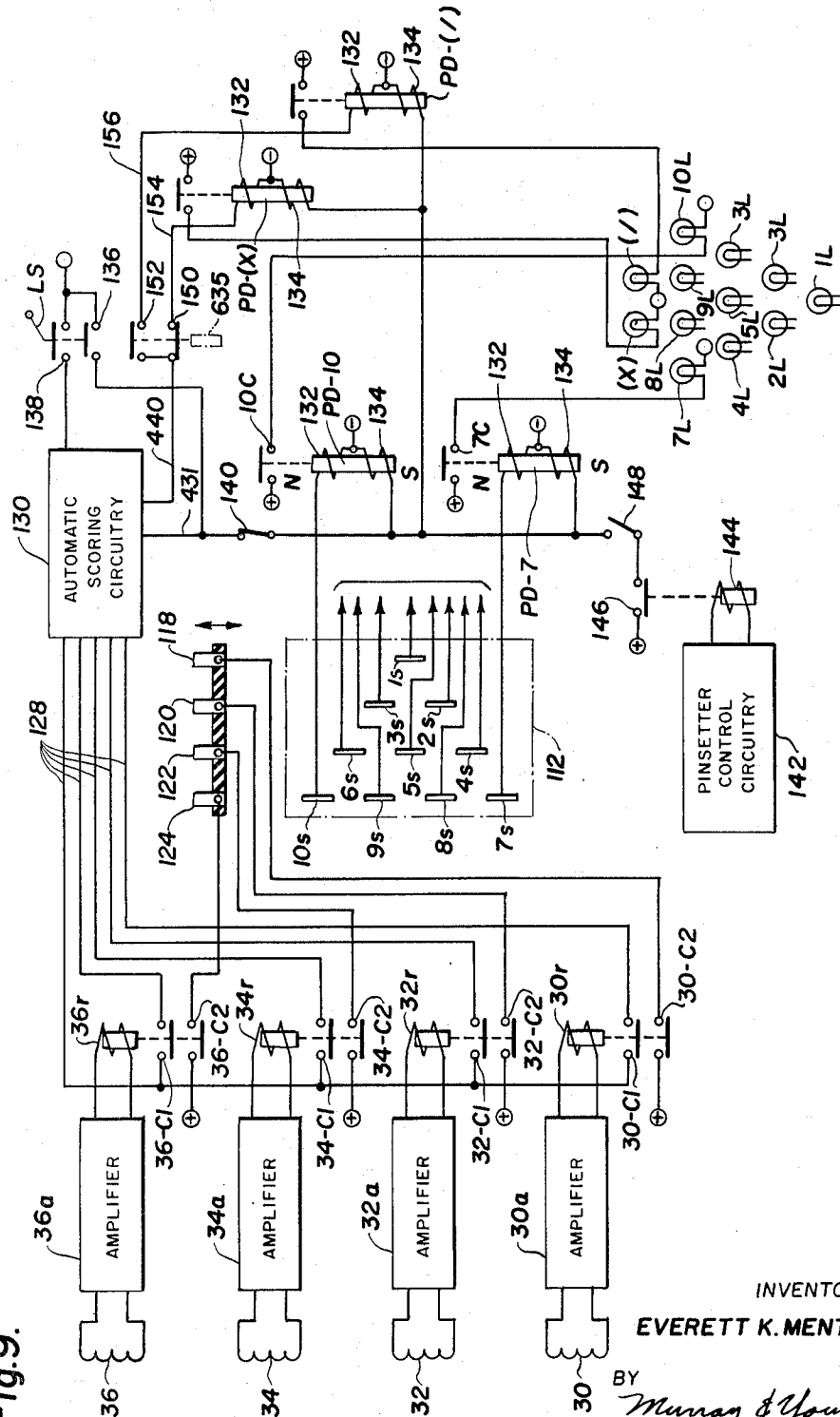
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4 Sheets-Sheet 4

Fig. 9.



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HORIZONTALLY MOVABLE PIN DETECTING MEMBER WITH SYNCHRONOUS SWITCHING SYSTEM FOR INDICATING STANDING PINS

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4 Claims. (Cl. 273—54)

This invention relates to apparatus for visually indicating the number and relative positions of standing pins on a bowling alley pin deck after each ball is delivered in a bowling game. More particularly, the invention relates to apparatus of the type described adapted to indicate not only the number and relative positions of standing pins but also the occurrence of strikes and spares.

In the past, systems operable in conjunction with an automatic pin-setter have been employed for indicating pinfall on a lighted score board positioned above a bowling alley pin deck. Such score boards usually comprise a series of ten electrical lamps arranged in the usual triangular configuration of the bowling pins, the arrangement being such that after the first ball in each frame is delivered, the lamps at the positions of the standing pins will be energized. In most of the systems in present-day use, the lamps are separately controlled by limit switches on the gripper arms of an automatic pin-setter, the arrangement being such that when the pin-setter frame moves downwardly during a pin-setting operation, the limit switches on only those gripper arms which grip standing pins will be conditioned to energize an associated lamp, while the limit switches on those gripper arms which close upon failing to grip a pin cannot energize their associated lamps.

The foregoing prior art system, although used extensively, has certain inherent disadvantages. For example, the pins on the deck may slide from their correctly-spotted positions after a ball is delivered without being knocked down, the result being that the gripper arms for that pin will close to give a false indication of a fallen pin. Another disadvantage resides in the fact that such systems usually give the pinfall results after the first ball delivery only. This is due to the fact that the pin-setter cycles to pick up pins with the gripper arms only after the first ball delivery, and if it is made to cycle in this manner after the second ball, an extra time-consuming step is introduced into the operation which serves no useful purpose in setting the pins.

As one object, the present invention provides a visual pinfall indicating system which overcomes the above and other disadvantages of prior art systems. Specifically, the invention provides means for visually indicating all standing pins, including those which slide from their correctly-spotted positions, as well as means for indicating the number and location of standing pins after both the first and second ball deliveries in a bowling game.

Another object of the invention is to provide a system for not only visually indicating standing pins but also the occurrence of strikes and spares after the first and second ball deliveries, respectively.

Still another object of the invention is to provide a standing pin indicator in which the standing pins are de-

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tected without making physical contact with those pins, and wherein the detecting and indicating system forms no part of an automatic pin-setter.

As will be seen, the present invention is particularly adapted for use with pinfall detecting apparatus of the type described in copending application Serial No. 134,809, filed September 7, 1961 and assigned to the assignees of the present application. In the aforesaid application Serial No. 134,809, standing pins are detected by means including an electrically detectable device in an end of each pin, and electrical detecting means movable relative to the ends of standing pins and adapted to produce an electrical pulse whenever it passes in close proximity to the end of a standing pin. The output of the electrical detecting means is, therefore, a number of electrical pulses corresponding to the number of standing pins. These pulses are used in the present invention in conjunction with a switch device for each pin, which closes only when the detecting means is over that pin, to energize a lamp which visually indicates the standing condition of the pin and its location.

Furthermore, the apparatus of the invention is usable with automatic scoring and totalizing apparatus such as that shown in copending application Serial No. 175,865, filed February 5, 1962, now U.S. Patent No. 3,124,355, issued March 10, 1964, also assigned to the assignees of the present application, for indicating the occurrence of strikes and spares after the first and second ball deliveries, respectively, in each frame.

The above and other objects and features of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings which form a part of this specification, and in which:

FIGURE 1 is a top view of a bowling alley pin deck showing the arrangement of the standing pin detector of the invention;

FIG. 2 is an elevational or side view of the carriage for moving the standing pin detector across the pin deck;

FIG. 3 is a top view of the apparatus of FIG. 2;

FIG. 4 is an end view of the apparatus of FIG. 2;

FIG. 5 is a cross-sectional view taken along line V—V of FIG. 4;

FIG. 6 is a cross-sectional view taken along line VI—VI of FIG. 4;

FIG. 7 is an end view of the apparatus of FIG. 4 taken substantially along line VII—VII of FIG. 4;

FIG. 8 is a cross-sectional view taken along line VIII—VIII of FIG. 4; and

FIG. 9 is a schematic circuit diagram of the visual standing pin indicating system of the invention.

Referring now to the drawings, and particularly to FIG. 1, the usual bowling alley is shown having a pin deck 12 with ten pins positioned thereon in the usual triangular configuration and numbered 1 through 10. On either side of the pin deck 12 are gutters 14 and 16, while behind the pin deck 12 is a pit 18. On either side of the pin deck 12 are kickbacks 20 and 22 which serve, among other things, to separate adjacent bowling alleys. Extending between the kickbacks 20 and 22 is a facing board 24 which, in accordance with the usual bowling alley construction, covers an automatic pin-setter and its associated mechanism in its raised position, but does not

extend down far enough toward the alley to obstruct the view of the pins positioned thereon. As will be seen, the facing board 24 may also carry or support the visual standing pin indicating lamps of the present invention.

Adapted to pass over the tops of the pins and beneath the pin-setter in its raised position is a bar 28 which forms a core for four electromagnetic coils 30, 32, 34 and 36 spaced along its length. In accordance with the teachings of the aforesaid copending application Serial No. 134,809, filed September 7, 1961, permanent magnets 37 are embedded in the tops of each of the pins 1-10, the arrangement being such that as the coils 30-36 sweep across the pins, a pulse will be induced in one of the coils for each standing pin, but not for fallen pins. If it is assumed, for example, that the first ball in a frame has been delivered and that four pins have been knocked down, six pins will remain standing with the result that the coils 30-36 will produce six electrical pulses which are subtracted from ten in circuitry such as that shown in U.S. Patent No. 3,124,355, to produce an indication of the number of fallen pins.

From a consideration of the triangular configuration of pins shown in FIG. 1, the necessity for a plurality of coils on the bar 28 will be understood. That is, it can be seen from FIG. 1 that the number 1 pin is directly in front of the number 5 pin. Similarly, the number 2 pin is directly in front of the number 8 pin, and the number 3 pin is directly in front of the number 9 pin. If a single coil were swept across the tops of the pins, a single current impulse would be induced in the coil for both of the pins 2 and 8, both of the pins 1 and 5, and both of the pins 3 and 9, meaning that if all of the pins were standing, only seven current impulses would be produced by the single coil; whereas it is desired to produce ten impulses. With the arrangement of the coils shown in FIG. 1, however, none of the pins covered by any one coil are aligned with other pins covered by that same coil so that the cumulative number of impulses produced by the four coils will always be ten, assuming that all of the pins are left standing. Of course, if certain ones of the pins are knocked down after a ball is delivered, only the cumulative number of impulses corresponding to the number of pins left standing will be produced by the coils. Furthermore, even though certain ones of the pins may slide on the deck to positions where they are directly in front of other pins, the correct number of impulses will always be produced. This is more fully explained in the aforesaid application Serial No. 134,809, filed September 7, 1961.

The bar 28 and the coils 30-36 carried thereby are suspended from a carriage 38 in cantilever beam relationship, this carriage 38 being movable along guideways or tracks 40 and 42 both located at the forward end of the pin-setter and extending between the kickbacks 20 and 22. With reference to FIGS. 2-7, it will be noted that bearing blocks 44 and 46 are bolted to the opposite ends of tracks 40 and 42. Carried between each set of bearing blocks 44 and 46 is a roll 48 or 50, respectively, the roll 48 being to the left in FIGS. 2 and 3 and comprising an idler roll, and the roll 50 being to the right in FIGS. 2 and 3 and comprising a driven roll. As best shown in FIGS. 2 and 4, one end of the driven roll 50 is connected through gears 52, 54 and 56 to a motor 58, this motor being mounted on plate 60 which, in turn, is carried on an inverted U-shaped bracket 62 having downwardly-depending legs 64 and 66 connected to the respective guideways 40 and 42.

The carriage 38 itself, as best shown in FIG. 4, comprises a main body portion 68 provided at its forward end with a downwardly-depending generally L-shaped portion 70, this latter portion being provided at its lower end with a socket 72 for receiving and supporting the bar 28 and the coils 30-36 carried thereby in cantilever beam relationship. It will be noted in FIG. 4 that the guideways 40 and 42 are generally C-shaped in cross section.

These guideways receive, for sliding movement, bars 74 and 76 which project outwardly from the sides of the upper portion 68 of carriage 38 and are covered or fitted with self-lubricating nylon shoes 78, the shoes acting as anti-friction members between the carriage 38 and the guideways 40 and 42.

With reference now to FIG. 6, it will be noted that a notch or keyway 80 is cut into the upper portion 68 of carriage 38. This notch 80 receives the opposite ends of a spring steel band 82; and, as best shown in FIG. 2, the band 82 passes around the rolls 48 and 50. The opposite ends of the band 82 are held within the slot or keyway 80 by means of set screws 84. Thus, when roll 50 (FIG. 6) is caused to rotate in a clockwise direction by motor 58, for example, the carriage will be caused to traverse the tracks 40 and 42 from right to left as viewed in FIGS. 2 and 3. Similarly, when the roll 50 is caused to rotate in a counterclockwise direction, the carriage 38 will be caused to traverse the tracks 40 and 42 in the opposite direction (i.e., from left to right as viewed in FIGS. 2 and 3). The spring steel band 82 should be as thin and flexible as possible while at the same time providing the requisite strength. If necessary or desirable, the peripheries of the driven and idler rolls 50 and 48, respectively, may be provided with a resilient outer coating such as neoprene to provide better frictional contact between the band and the rolls. An electrical control system, such as that shown in copending application Serial No. 179,667, filed March 14, 1962, and now Patent No. 3,158,371, and assigned to the assignees of the present application, may be used for causing the motor 58 to traverse the carriage to the right or left. For purposes of the present application, it will be sufficient to state that a suitable electrical control system will be included which will cause the carriage 38 to be traversed from the extreme right-hand position (i.e., FIG. 1) above the pin deck to its extreme left-hand position when a ball is delivered in a bowling game and strikes the backstop, not shown, behind the pit 18. Upon delivery of the next or succeeding ball, the carriage 38 will then be caused to traverse the pin deck from left to right as viewed in FIG. 1.

With reference to FIG. 5, one side of the upper portion 68 of carriage 38 is provided with an outwardly-extending bar or projection 86 which engages a rubber pad or cushion 88 on a stop member 90 which is welded or otherwise securely fastened to the right end of guideway 42. In a similar manner, the left end of the guideway 42, as viewed in FIG. 2, is provided with a similar stop member 92 and rubber pad 94 for engaging the other side of bar 86 when the carriage is at its extreme left-hand position as viewed in FIGS. 1, 2 and 3.

With reference to FIG. 7, it will be noted that the track 40 is also provided with an angle 96 at one end which is welded or otherwise securely fastened to the underside of the track. Carried on the inside surface of the downwardly-depending leg of angle 96 is a rubber pad 98 adapted to fit into a recess 100 on carriage 38 and engage a surface 102 provided on a bar or projection 104 extending outwardly from the main body of the carriage 38. As shown, the bar 104 has a similar recessed portion 105 and surface 106 on its opposite side adapted to engage a rubber pad 108 secured to an angle 110 (FIG. 2) at the opposite end of the guideway 44. Thus, the carriage 38 will engage the rubber pads 88, 98 and 94, 108 at opposite ends of the guideways. These rubber pads are of primary importance to prevent a whiplash condition in the bar 28. That is, in the absence of the rubber cushions, a sharp impact at the end of the guideways could cause severe vibration in the bar 28 which would possibly damage the assembly or cause a false indication of pinfall. The necessity for the recessed portions providing surfaces 102 and 106 on carriage 38 becomes apparent when it is remembered that the bar 28 and the coils carried thereby must be moved into abutting relationship with the kick-

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backs 20 and 22 to permit the pin-setter to move downwardly during a pin-setting operation. That is, the bar 28 must be moved to the side as far as possible, and the recessed portions 100 permit this while at the same time facilitating the cushion effect mentioned above.

In accordance with the present invention, an insulating board, generally indicated by the reference numeral 112 in FIGS. 2, 4, 5, 7 and 8, is provided beneath the guideway 42 and carried on an angle 114 bolted to the side of guideway 42 as shown. Positioned on the insulating board 112 are ten contact strips (FIG. 8) identified by the numerals 1S-10S, one contact strip being provided for each of the pins 1-10. Furthermore, it will be noted that the strips 1S-10S are arranged in a triangular configuration having the same width as the triangular configuration of pins, but compressed or shortened along the length of the alley. This, of course, is for the purpose of convenience in order to reduce the width of the insulating board 112.

As best shown in FIG. 5, an insulator 116 is provided on bar 86 of carriage 38. Four wiper brushes 118, 120, 122 and 124 (FIG. 4) are carried on the underside of the insulator 116 and secured thereto by screws 126 (FIG. 5) which are also insulated from the brushes. The wiper brush 118 is aligned with the single contact strip 1S for the number 1 pin; wiper brush 120 is aligned with the contact strips 2S and 3S for pins 2 and 3; wiper brush 122 is aligned with contact strips 4S, 5S and 6S for pins 4-6; and wiper brush 124 is aligned with contact strips 7S-10S for pins 7-10. It can thus be seen that as the carriage 38 traverses the guideways 40 and 42 in either direction, the wiper brushes 118-124 will successively engage and make contact with the strips 1S-10S with which they are aligned. These brushes are connected through leads, not shown in FIGS. 1-8, to the circuitry of FIG. 9; hereinafter described.

With reference now to FIG. 9, it can be seen that the coils 30, 32, 34 and 36 are each connected to amplifiers 30A, 32A, 34A and 36A, respectively. The outputs of amplifiers 30A-36A are, in turn, applied to the energizing coils for relays 30R-36R, respectively. As the bar 28 and the coils carried thereby sweep across the tops of the standing pins on the pin deck, a pulse will be induced in each coil as it passes over the top of a standing pin. Let us assume, for example, that all of the pins except numbers 6 and 10 remain standing after the delivery of a ball in a bowling game. Under these circumstances, one pulse will be produced by coil 30 to energize relay 30R once, two pulses will be produced by coil 32 to energize relay 32R twice as the coil sweeps over the tops of the number 2 and 3 pins, two pulses will be produced by coil 34 to energize relay 34R twice as it sweeps across the number 4 and 5 pins, and three pulses will be produced by coil 36 to energize relay 36R three times as it sweeps across the number 7, 8 and 9 pins. Each time any one of the relays 30R-36R is energized, it closes a pair of normally open contacts 30-C1 to 36-C1, respectively, thereby producing a number of pulses on leads 128 corresponding to the number of standing pins. These pulses, in turn, are applied to automatic scoring circuitry 130 such as that shown in the aforesaid U.S. Patent No. 3,124,355 where they are converted into a number of pulses corresponding to the number of fallen pins. These latter pulses (i.e., those corresponding to the number of fallen pins) are then employed for the purpose of automatically scoring the game.

Also included on each of the relays 30R-36R is a second pair of normally open contacts 30-C2 to 36-C2. One side of each of the contacts 30-C2 to 36-C2 is connected to a source of positive voltage as shown, while the other side is connected to an associated one of the wiper brushes 118-124. Contacts 30-C2 associated with coil 30 which sweeps over the number 1 pin are connected to wiper brush 118; contacts 32-C2 associated with coil 32 which sweeps over pins 2 and 3 are connected to wiper

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brush 120; contacts 34-C2 associated with coil 34 which sweeps over pins 4, 5 and 6 are connected to wiper brush 122; and contacts 36-C2 associated with coil 36 which sweeps over pins 7, 8, 9 and 10 are connected to the wiper brush 124. The wiper brush 118, as mentioned above, is aligned with the contact strip 1S on insulating board 112 while the other wiper brushes 120, 122 and 124 are aligned with the contact strips corresponding to the pins over which their associated coils 32, 34 and 36 pass. Each of the contact strips 1S-10S is, in turn, connected to a magnetic lock-type relay, only the relays PD-10 and PD-7 for pin numbers 7 and 10 being shown in FIG. 3. As shown, each of the magnetic lock relays PD-10 and PD-7 is provided with two coils or windings 132 and 134 wound about an armature. At the opposite ends of the armature are magnetic north and south poles marked N and S, respectively, the arrangement being such that when the coil 132, for example, is energized the armature will be pulled downwardly as viewed in FIG. 9 and will remain in that position due to the fact that it is in engagement with the south pole. On the other hand, when the coil 134 is energized, the armature will be caused to move upwardly and remain in this upper position due to the fact that it now contacts the north pole. In the usual case, the north and south poles will be provided by a C-type permanent magnet, although any other suitable magnet means may be employed to provide the necessary opposing magnetic poles. Each of the contact strips 1S-10S is connected to an associated winding 132 on one of the magnetic lock-type relays PD-1 to PD-10. In order to energize the windings 132 and close normally open contacts 10C and 7C, for example, one of the wiper brushes 118-124 must contact an associated one of the contact strips 1S-10S at the time when an associated one of the contacts 30-C2 to 36-C2 is closed. Let us assume, for example, that pin numbers 2, 4, 5, 7 and 8 remain standing after a ball is delivered in a bowling game. As the bar 28 sweeps across the pin deck, the wiper brush 124 will first contact the strip 10S, but since pin number 10 has been knocked down no pulse is induced in the coil 36 to close contacts 36-C2 so that winding 132 on relay PD-10 is not energized. The same applies for pin numbers 3, 6 and 9. That is, when wiper brush 122 contacts strip 6S, for example, the coil 34 will not produce a pulse since pin number 6 has been knocked down with the result that the relay PD-6 for the number 6 pin is not energized. When, however, the bar 28 sweeps over the number 1 and 5 pins, pulses are induced in the coils 30 and 34 due to the fact that these pins are standing. Consequently, contacts 30-C2 and 34-C2 close; and at the same time wiper brush 118 contacts strip 1S while wiper brush 122 contacts strip 5S. The result is that a circuit is completed to windings 132 on relays PD-1 and PD-5 for the number 1 and 5 pins, thereby closing their contacts 1C and 5C to energize lamps 1L and 5L. As the bar 28 continues movement across the tops of the pins, pulses will be induced in coils 32 and 36 to energize lamps 2L and 8L. Thereafter, a pulse will be induced in coil 34 to energize lamp 4L; and, finally, a pulse will be induced in coil 36 to energize lamp 7L. Since each of the relays PD-1 to PD-10 is of the magnetic lock-type, once the windings 132 are energized in the manner described above, the contacts for these relays will remain closed and the lamps energized until the windings 134 are energized to open the contacts. Although the foregoing description assumes that the bar 28 swept across the pins from right to left as viewed in FIG. 1, it will be apparent that the operation will be the same when the bar sweeps across the pins from left to right. Thus, whenever the bar 28 sweeps across the pins, those lamps corresponding to the standing pins will be energized to indicate the number and location of the standing pins; whereas those lamps for the fallen pins will not be energized. Furthermore, the lamps will remain energized until the coils 134 on

relays PD-1 to PD-10 are energized to open contacts 1C to 10C.

The coils 134 may be energized in one of several different ways. For example, a limit switch LS may be provided which is tripped to close contacts 136 when a ball strikes the backstop of the bowling alley, this limit switch LS also having contacts 138 thereon which initiate operation of the automatic scoring circuitry 130 in accordance with the teachings of the aforesaid U.S. Patent No. 3,124,355. Thus, whenever a ball is delivered in a bowling game and strikes the backstop, the contacts 136 will be closed to energize coils 134, assuming that switch 140 is closed. Ordinarily, all of the lamps 1L-10L will be extinguished when the first ball in a frame is delivered, meaning that when the first ball strikes the backstop and trips the limit switch LS, closure of its contacts 136 will have no effect on the circuitry. Thereafter, the bar 23 will sweep across the tops of the pins to energize a number of the lamps 1L-10L corresponding to the number of standing pins, assuming that a strike was not achieved by knocking down all ten pins. These lamps, then, may remain energized until the second ball is delivered and limit switch LS is again tripped to close contacts 136, whereupon all lamps are extinguished and the bar 28 again sweeps across the tops of the pins to energize a number of the lamps corresponding to the number of standing pins after delivery of the second ball, assuming that a spare has not been made with the second ball.

By reference to the aforesaid U.S. Patent No. 3,124,355 it can be seen that at the completion of each frame in a bowling game, a pulse is received on a lead, identified as lead 431 in the said U.S. Patent No. 3,124,355. This pulse can then be applied from lead 431, shown in FIG. 9, to the coils 134 to open all of the contacts 1C-10C and extinguish the lamps at the completion of the frame. With this arrangement, the lamps would be extinguished upon closure of limit switch LS when the second ball is delivered and by a pulse on lead 431 at the completion of the frame.

An alternative arrangement for energizing coils 134 and extinguishing the lamps may be through the pin-setter control circuitry, generally indicated at 142 in FIG. 9. Under this arrangement, the relay 144 would be energized at the completion of each cycle of the pin-setter, thereby closing contacts 146. If switch 148 is now closed and switch 140 open, the coils 134 will be energized at the completion of each cycle of the pin-setter to extinguish the various lamps. In this latter case, of course, the lamps will be extinguished sooner after the first ball than they will by using the limit switch LS since the pin-setter will complete its first ball cycle before the second ball is delivered.

Also provided on the indicating panel are two lamps identified as X (strike) and / (spare). These lamps are, in turn, controlled by relays PD-X and PD-/ , respectively each including coils 132 and 134 which serve the same purpose as coils 132 and 134 for relays PD-1 to PD-10 already described. By reference, again, to U.S. Patent No. 3,124,355, it will be seen that one pulse is produced on a lead 440 shown and described in said application each time a spare is achieved in a bowling game; whereas two pulses are produced on this same lead 440 each time a strike is achieved. Furthermore, the automatic scoring circuitry shown in U.S. Patent No. 3,124,355 includes a second ball latch relay 635 which is energized after the delivery of the first ball in a bowling game. By connecting the aforesaid lead 440 to pairs of normally closed and normally open contacts 150 and 152, respectively, on the aforesaid second ball latch relay 635, it can be seen that in a first ball cycle pulses will be applied to lead 154, whereas in a second ball cycle when the contacts 152 are closed and contacts 150 are open, a pulse will be applied to lead 156. The pulse on lead 154 will energize coil 132 on

relay PD-X, thereby energizing the lamp X to indicate that a strike has been made with the first ball in a frame. On the other hand, when ten pins are knocked down with the first and second balls, the contacts 152 will close; and when a pulse is received on lead 440, it will be applied through lead 156 to coil 132 on relay PD-/ , thereby indicating the spare lamp (/) to indicate that a spare has been achieved with the second ball. The lamps (X) and (/) are extinguished or deenergized in the same manner as lamps 1L-10L. That is, when the frame is completed and a pulse is received on lead 431, the coils 134 will be energized to open their contacts if switch 140 is closed. On the other hand, if switch 148 is closed, the lamps (X) and (/) will be extinguished when the pin-setter cycles.

Although the invention has been shown in connection with a certain specific embodiment, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention. In this respect, it will be apparent that the coils 30-36 and bar 28 could be moved across the bottoms of the pins in a cavity beneath the pin deck in accordance with the teachings of copending application Serial No. 134,809, as well as over the tops of the pins.

I claim as my invention:

1. Apparatus for visually indicating the number of standing pins on a bowling alley pin deck comprising a member adapted to be moved past the ends of the pins transversely of the alley and along a substantially horizontal path, a plurality of spaced pin detecting devices carried on said member, each of the detecting devices being adapted to produce an electrical signal as it passes the end of a standing pin and each of said devices being arranged on the member to sweep across a predetermined zoned area above the pin deck such that it will detect only those pins within its zoned area, an insulating contact board extending transversely across the pin deck at the forward end thereof and having a plurality of contacts thereon each of which is aligned with the position of an associated pin on the pin deck, the contacts being ten in number and arranged on the contact board in a triangular configuration corresponding to the normal triangular configuration of ten standing pins positioned on the pin deck, wiper brush means on said member adapted to engage said contacts as the member moves transversely across the pin deck along its substantially horizontal path of travel, the wiper brush means comprising a number of brushes corresponding to the number of spaced pin detecting devices, each brush being electrically connected to an associated one of said detecting devices and positioned to engage those contacts on the contact board corresponding to the pins which can be detected by its associated detecting device, lamp means for each pin energizable to visually indicate that the pin is standing, and circuit means including the wiper brush means and said contacts for energizing the lamp for any pin when a signal is produced by one of said detecting devices as it passes by that pin and an associated one of said brushes contacts the contact on the insulating board for that pin.

2. The apparatus of claim 1 wherein said member adapted to be moved past the ends of the pins transversely of the alley and along a substantially horizontal path is carried in cantilever beam relationship on a track structure extending transversely across the pin deck at the forward end thereof, and wherein said insulating contact board is supported by said track structure.

3. The apparatus of claim 1 wherein there are four brushes and four pin detecting devices.

4. The apparatus of claim 1 including lamp means for indicating that a strike has been made after the delivery of the first ball in a frame of a bowling game, lamp means for indicating that a spare has been made after

the delivery of the second ball in a frame, circuit means for energizing said strike-indicating lamp means when ten pins have been knocked down upon the delivery of the first ball in a frame, and circuit means actuable when ten pins have been knocked down with the first and second balls in a bowling game frame for energizing said spare-indicating lamp means.

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