

[54] APPARATUS FOR AIDING BLIND BOWLERS

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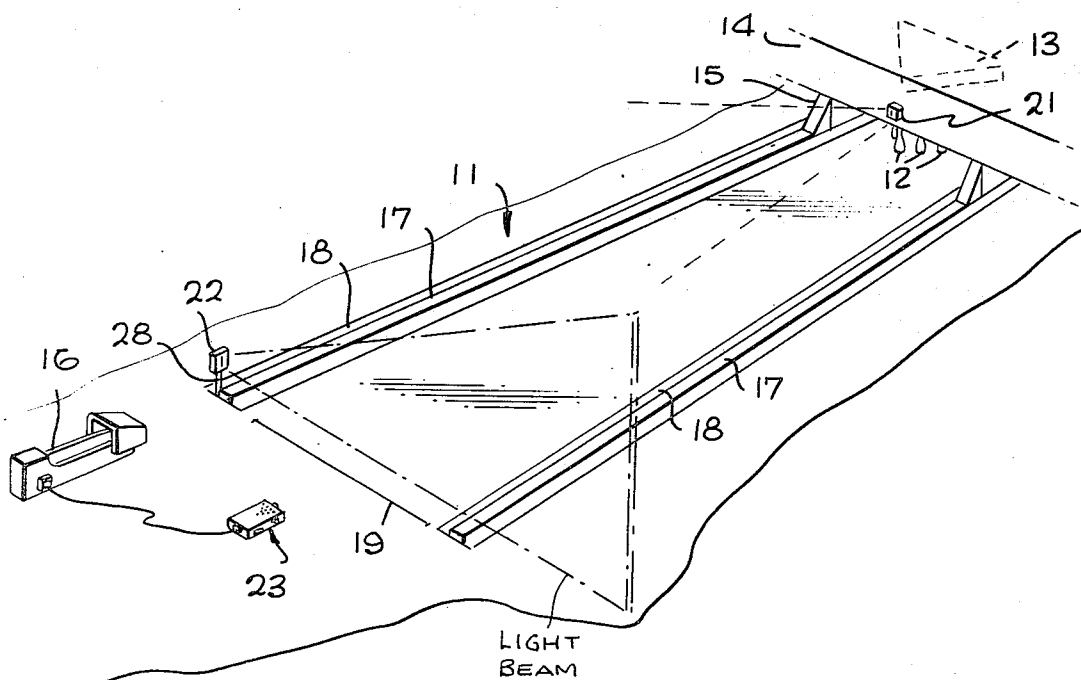
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ABSTRACT

Apparatus for aiding blind bowlers including a hand held unit incorporating position locating means utilizing a pair of first optical sensors adapted to sense and actuate distinguishable non-visual signals in response to narrow beams of light directed along the imaginary center line and the foul line of the bowling alley, and pin indicating means in the form of spring biased solenoid operated markers corresponding to the bowling pins and adapted to project from the face of the unit when second optical sensors mounted above the pins respond to light beams directed so as to be reflected into them by the standing pins.

17 Claims, 8 Drawing Figures

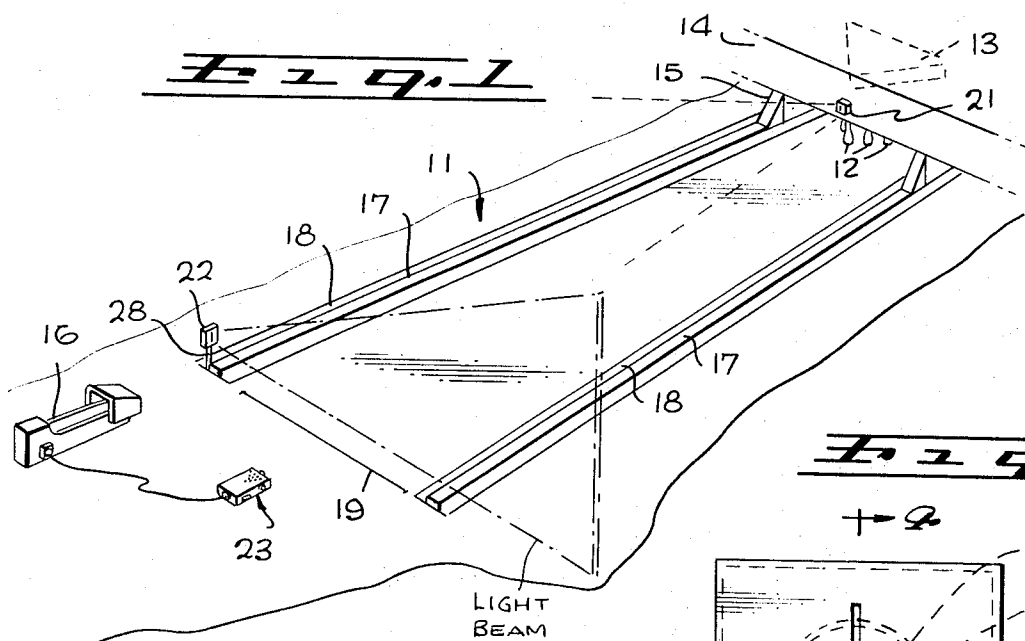


Fig. 2

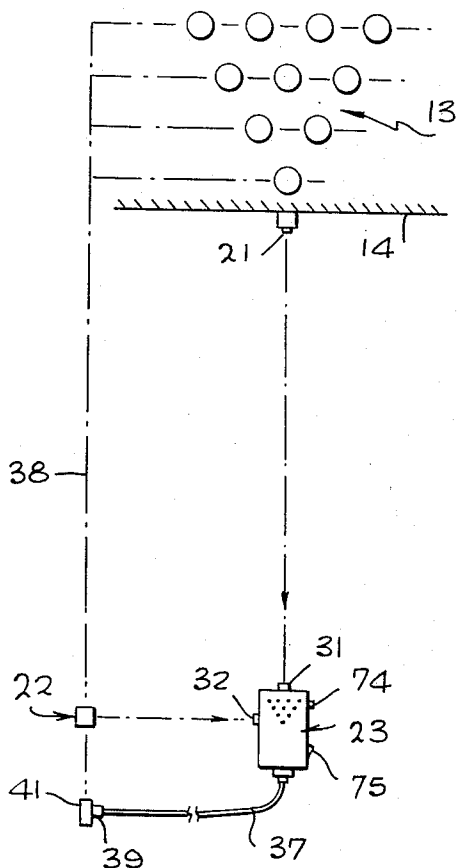


Fig. 3

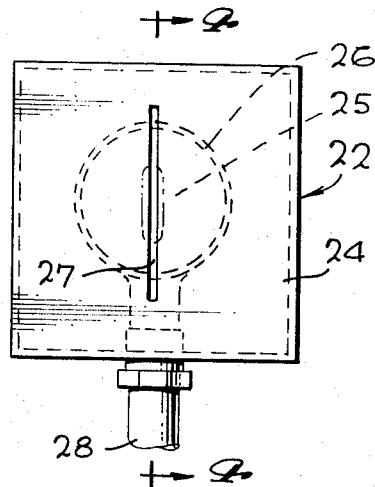


Fig. 4

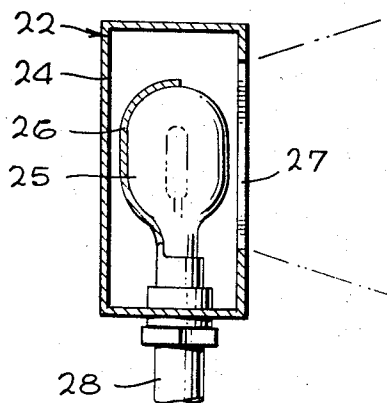


Fig. 5

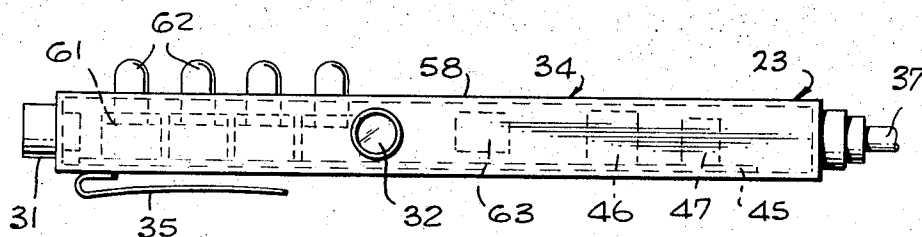


Fig. 8

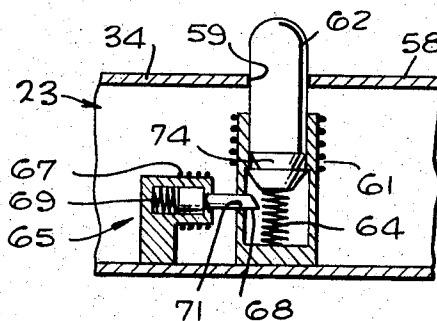


Fig. 6

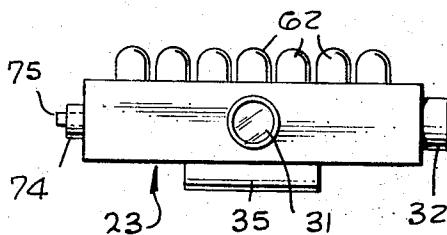
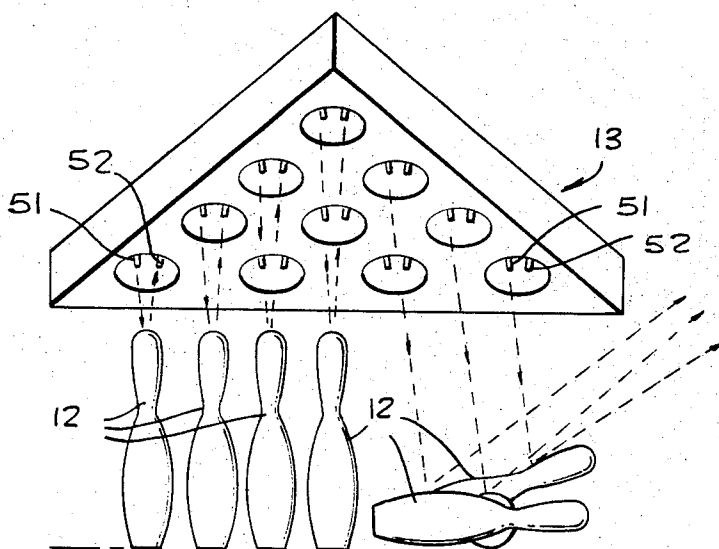


Fig. 7



APPARATUS FOR AIDING BLIND BOWLERS

BACKGROUND OF THE INVENTION

The present invention relates to bowling aids for the sightless and, more specifically, to apparatus to assist the blind bowler in determining his position with respect to the center line and foul line of the bowling alley and the number and location of pins remaining standing after he has bowled each ball.

Various devices have been developed over the years to indicate to the blind bowler the position of the pins in the alley. Such prior art devices have included magnetic sensors imbedded in mats laid in the alley or built into the alley itself and adapted to sense the presence of metal plates attached to the bottoms of the pins, probes and brushes attached to the automatic pinsetting machinery so as to make contact with the standing pins during the pin-setting operation, sensing switches connected to the pin-grasping mechanisms of the pin-setting machinery to be activated when the standing pins are raised from the alley during the sweeping phase of the automatic setting operation, and many other ingenious arrangements. None of these has proved to be entirely satisfactory, and none has been widely adopted.

Likewise, a variety of relatively crude systems have been proposed to enable the blind bowler to orient himself with respect to the alley for delivery of the ball. These have commonly required construction or placement of structures on or adjacent to the alley and have proved to be awkward and cumbersome to use and generally unacceptable.

The increasing interest in bowling both as a source of recreation and a means to instill self-confidence for the sightless has given impetus to the quest for bowling aids which overcome the problems associated with these prior art devices and apparatus. The subject invention is an outgrowth of this quest.

SUMMARY OF THE INVENTION

The invention contemplates a compact, lightweight hand held unit incorporating both position locating means and pin indicating means. The former utilizes a pair of optical sensors mounted perpendicular to one another in the unit and adapted to sense narrow beams of light directed in vertical planes above the imaginary center line and foul line of the bowling alley and to actuate signal means within the unit to produce signals, such as audible sounds or vibrations, recognizable by the sightless, in response thereto. The latter employs a set of spring biased solenoid operated markers arrayed in a triangular pattern corresponding to the actual pins and adapted to project from the face of the unit when optical sensors mounted above the pins respond to light beams directed so as to be reflected into them by the standing pins. With this unit the blind bowler is able to locate the center of the alley and the foul line and from this reference point to establish his starting position for the approach to his preferred release point. After bowling his first ball, by feeling the markers projecting from the face of the unit he can determine which, if any, of the pins are still standing and, with reference to the center line and foul line he can adjust his starting position for the approach to a new release point. At the end of the frame the markers again indicate the number and location of any pins remaining upright.

The principal object of the subject invention is to provide a system incorporating an inexpensive, easily maintained hand held unit with which the blind bowler may easily and accurately determine his position with respect to the alley and the number and location of the standing pins.

Another object of the invention is the provision of such a system which can readily be installed in either new or existing alleys and which, when installed, does not interfere with their conventional use by sighted bowlers.

Still another object is the provision of such a system which does not require the use of special non-regulation pins or the alteration of the surface of the alley.

Yet another object is the provision of pin spotting means in a system of the type described which can be adapted to any of the numerous forms of automatic pin setting equipment.

Other and further objects and advantages of the subject invention will become apparent from a consideration of the following description of a preferred embodiment of the invention as illustrated in the appended drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a typical lane in a conventional bowling alley with a preferred embodiment of the subject invention installed;

FIG. 2 is a diagrammatic top view of the installation of FIG. 1 showing the various components of the invention and the lane out of scale for greater clarity;

FIG. 3 is a front elevational view of a typical light projector as used in the subject invention;

FIG. 4 is a side sectional view of the projector of FIG. 3 taken in the direction 4—4;

FIG. 5 is a side elevational view of the hand held unit of the invention;

FIG. 6 is an end view of the unit of FIG. 5;

FIG. 7 is an upwardly directed side perspective view of the underside of a fanciful pin setting stage showing the positioning of the pin position sensing means and their relationship to a set of bowling pins after some pins have been knocked down; and

FIG. 8 is an enlarged fragmentary side sectional view taken through a typical one of the pin markers of the unit of FIGS. 5 and 6.

Wherever practicable, like numerals are used to designate the same or similar components in the several figures.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 illustrate a typical lane 11 of a conventional bowling alley with the subject invention installed. Pins 12 at one end of the lane 11 are positioned by either manually operated or automatic pin setting machinery which is normally shielded from view by a screen 14. Spent balls are deposited in ball return chutes 15, either manually or by an automatic ball return (not shown) and are returned to rack 16 through tunnels or guides 17 adjacent gutters 18 which lie along the edges of lane 11. A transverse foul line 19 is painted or inlaid across the approach end of lane 11 and must not be crossed by the bowler.

In its preferred embodiment the subject invention comprises a center line light source 21 and a foul line

light source 22, pin sensing means mounted under pin setting mechanism 13 and a hand held unit 23 all of which will be described in greater detail hereinbelow.

Light sources 21 and 22 are generally of similar construction but will be described by reference to FIG. 3, which illustrates the latter, since in the installation shown here foul line light source 22 has certain additional features not required by light source 21.

Both light sources 21, 22 consist of a more or less conventional casing 24 containing a high intensity electrical lamp 25 and a light intensifying reflector 26. An elongated aperture or slit 27 is formed in the face of casing 24, centered on lamp 25, so as to direct the light from lamp 25 and reflector 26 outwardly of casing 24 in a narrow beam closely approximating a vertical plane. Conventional electrical circuitry carries power for the lamps 25 of both light sources 21, 22.

Light source 21 is preferably mounted on or behind an opening through screen 14 above the imaginary center line of lane 11, so that the beam of light emerging from slit 27 lies in the vertical plane passing through the imaginary center line of lane 11. Foul line light source 22 is positioned at either side of the approach end of lane 11 and aligned so that the light emitted from slit 27 lies in a vertical plane above foul line 19. Light source 22 may be so positioned by means of hollow support 28 located between adjacent alleys so as to be out of the way of the bowlers.

In light of the disproportionate distances covered by the respective beams of light sources 21 and 22 it may be desirable to utilize a lamp of somewhat higher intensity and a slit of some what shorter length and narrower width in center line light source 21 than in foul line light source 22. Likewise it may be found desirable to utilize conventional optical lens systems in conjunction with the slits 27 of the two light sources, 21, 22 to enhance the characteristics of the light beams emitted by them.

As shown in FIGS. 2, 5 and 6, hand held unit 23 is provided with a pair of electric eyes or photoelectric cells 31, 32. Photoelectric cell 31 is mounted in one end of unit 23 and aligned with the center line of the unit. Photoelectric cell 32 is mounted in the side of unit 23 with its optical axis perpendicular to that of photoelectric cell 31 and transverse to the major axis of unit 23.

Unit 23 is provided with a hollow casing 34, preferably formed of light-weight high-impact plastic or sheet metal and is adapted to be held in the bowler's hand. A hook or spring clip 35 is formed on the rear side of the casing at one end to permit the bowler to hook the unit onto his belt or some other part of his clothing if desired in order to leave both of his hands free.

Within the casing and shown in phantom for illustrative purposes only in FIGS. 5 and 6 are the various components required to perform the position locating and pin indicating functions referred to earlier and hereinafter described in greater detail. A lightweight reinforced insulated cable 37 attached to the rear end of casing 34 carries both electrical power lines and electrical leads 38 from the pin sensing apparatus mounted under the pin setting machinery 13 to unit 23. Cable 37 may be attached permanently at some convenient point along the edge of the approach end of the alley, but preferably it is provided with a plug 39 adapted to be releasably inserted into a receptacle 41 containing power and pin sensing lead terminals. This

latter arrangement lends itself particularly to installations in which the pin sensing leads are run through ball return tunnel 17 and into ball rack 16, since the receptacle 41 may be mounted with a minimum of effort on the side of ball rack 16 as shown in FIG. 1.

Photoelectrical cells 31, 32 are of conventional design and are adapted to respond when they are substantially aligned with the light beam planes of the light emitted by center line light source 21 and foul line light source 22, respectively. Any one of a variety of well known means such as polarizers, colored filters or lamps, coded light interrupters, or the like, may be employed to enable photoelectric cells 31 and 32 to discriminate positively between the light emitted by center line light source 21 and that emitted by foul line light source 22; however, generally such sophisticated means are not required since the sightless bowler experiences little if any difficulty in orienting himself generally with respect to the lane 11 when he is some distance from the foul line 19, and the arrangement of photoelectric cells 31 and 32 in casing 34 substantially eliminates the possibility of his confusing one light beam for the other when he is in close proximity to the foul line.

Conventional circuitry, preferably printed on circuit boards 45, utilizes the response signals generated by photoelectric cells 31, 32 to actuate one or more signalling devices, such as vibrator 46 and buzzer 47, positioned inside casing 34. The only criterion for the signalling devices employed is that they produce a signal which can be sensed by the sightless bowler. Preferably the signal associated with each of the photoelectric cells 31, 32 should be sufficiently different from the other as to be readily distinguishable by him. This is not to preclude the possibility, however, of providing the hand held unit 23 with a selector switch (not shown) to enable the user to activate one or the other of photoelectric cells 31, 32 and its associated circuitry selectively in order to achieve substantially the same results.

Referring to the pin sensing apparatus as illustrated in FIG. 7, while any one of a number of well known pin sensing means may be utilized with at least partial success in the subject invention, the preferable apparatus employs a plurality of paired light projectors 51 and optical sensors or photoelectric cells 52 mounted on the underside of the pin setting machinery 13. These may be built into the machinery 13 in its initial construction, or added to existing machinery as accessories. The paired projectors 51 and sensors 52 are positioned and oriented so that narrow beams of intense light directed downwardly by the projectors 51 strike the heads of their associated standing pins 12 and are reflected upwardly thereby into their respective sensors 52. Since the pins 12 are spotted in substantially the same position for each frame, the positioning and orientation of projectors 51 and sensors 52 is a relatively simple matter. The actual construction and mounting means used with the projectors 51 and sensors 52 are conventional and matters of design expediency, as are the circuitry and associated components used to power the projectors and sensors and to carry the signals from the sensors 52 to the hand held unit 23. It should be noted that these signals need not be carried by wires such as leads 38 previously discussed, but may be transmitted across the relatively short distances involved by radio or optical means as well, or by any other convenient method.

As shown in FIG. 7, the preferred pin sensing apparatus utilizing light projectors and optical sensors is capable of determining which is any of the pins is standing at all times as long as the pin setting mechanism 13 is in its rest position above the pins. This is a significant advantage over the several prior art sensing arrangements which sense the presence of standing pins only when the pin setting machinery 13 is in its lowered position. Such devices are not capable of reporting on the status of the pins after the second ball of a frame is bowled, since the machinery 13 does not normally descend again until all of the pins, those standing as well as those which have been knocked down, have been removed or swept from the alley and all of the pins are re-spotted for the following frame.

Referring again to FIGS. 2, 5 and 6, and to FIG. 8, the upper face 58 of casing 34 is provided with a plurality of openings 59 arrayed to correspond to the positions of the pins 12 in the alley. A conventional solenoid 61 is positioned inside casing 34 under each of the openings 59. Each of the solenoids 61 has an elongated ferrous metal core 62 which serves as a pin marker and is adapted to be thrust upwardly through its associated opening 59 under the influence of an expansion spring 64 located in the base of solenoid 61. Solenoid 61 is wound so that when it is energized it forces pin marker 62 downwardly against the thrust of expansion spring 64.

Marker engaging mechanism 65 includes a solenoid 67 containing a ferrous metal core 68 adapted to be thrust by expansion spring 69 through an opening 71 in the side of solenoid 61 at a point which is below the lower end of pin marker 62 when pin marker 62 is in its uppermost position.

Pin marker 62 is provided with an annular groove 74 in its side adapted to receive the end of core 68 of solenoid 67, and is preferably bevelled at its lower end to cam core 68 out of its way when solenoid 61 is energized and forces pin marker 62 downwardly. Groove 74 is positioned so that when core 68 engages it, the upper end of pin marker 62 is substantially level with the upper face 58 of casing 34. When solenoid 67 is energized, core 68 is withdrawn from groove 74, thereby releasing pin marker 62 to respond once again to the influence of expansion spring 64.

In this embodiment of the pin indicating portion of the invention, circuitry is provided which energizes each solenoid 61 when the output signal of its associated optical sensor 52 is terminated, indicating that its corresponding pin 12 is no longer standing.

Circuitry is likewise provided to allow all of the solenoids 67 to be energized when a reset button 74 is depressed. By this means all of the pin markers 62 may be reset at the beginning of each frame to indicate that all of the pins are standing. This arrangement precludes the possibility of the sightless bowler releasing his ball prematurely, since the pin markers 62 will not remain in their extended position unless and until the pins 12 are standing and the pin setting mechanism 13 has returned to its rest position.

As a matter of convenience a switch 75 may be provided to permit the unit 23 to be deactivated when it is not in actual use.

It will be apparent from the foregoing that the embodiment of the invention described here for illustrative purposes is but one, and that the specific components shown are but a few, of those which fall within

the scope and range of the invention as hereinafter claimed.

I claim as my invention the following:

1. Apparatus for aiding blind bowlers comprising a hand held device incorporating position locating means and pin indicating means, whereby the bowler can determine his position with respect to the alley and which pins remain standing after each ball is bowled, said position locating means including sensor means adapted to sense beams of light generated in connection with the alley to represent lines of reference thereon.
2. Apparatus according to claim 1 whereby the foul line and an imaginary center line are defined as lines of reference by narrow beams of light projected in vertical planes above the two lines.
3. Apparatus according to claim 2 wherein the sensor means are optical.
4. Apparatus according to claim 3 wherein the foul line is defined by a light beam source adjacent one side of the alley, the imaginary center line is defined by a light beam source positioned adjacent the bowling pins, and the sensors are located in the hand held device.
5. Apparatus according to claim 4 in which each of the sensors is operatively connected to a signal source producing a characteristic non-visual signal, which is recognizable by the sightless bowler.
6. Apparatus according to claim 1 in which the pin indicating means includes a plurality of markers positioned to correspond to the respective pins and adapted to indicate which pins are standing.
7. Apparatus according to claim 6 wherein the markers are upper portions of central cores of a first series of solenoids.
8. Apparatus according to claim 7 wherein the markers are urged axially in one direction by resilient means and in the opposite direction by said solenoids when the latter are energized.
9. Apparatus according to claim 8 wherein the markers are thrust outwardly of the device by expansion springs within their respective solenoids and energizing a solenoid causes its corresponding marker to retract into said device.
10. Apparatus according to claim 9 in which the markers are provided with releasable restraining means to retain them in a desired position.
11. Apparatus according to claim 10 in which the restraining means include a recess in the side of each marker and engaging means adapted to enter and engage said recess.
12. Apparatus according to claim 11 in which the engaging means comprises a second series of solenoids corresponding to said first series of solenoids and positioned generally perpendicular thereto, each solenoid of the second series being provided with a central core having an end portion adapted to engage the recess in its corresponding marker.
13. Apparatus according to claim 12 in which each central core of said second series of solenoids is urged axially in one direction by resilient means within its corresponding solenoid and in the opposite direction by said solenoid when the solenoid is energized.
14. Apparatus according to claim 6 which includes a plurality of sensor means adapted to sense beams of light generated in conjunction with the bowling pins and reflected by the standing pins.
15. Apparatus according to claim 14 including a plurality of light beam sources positioned above the bowl-

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ing pins and adapted to direct beams of light to be reflected by their corresponding standing pins into their respective sensor means.

16. Apparatus according to claim 15 in which the sensor means include optical sensors.

17. Apparatus for sightless bowlers including a hand held device incorporating position locating means utilizing a pair of first optical sensors adapted to sense

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narrow beams of light directed along the foul line and the imaginary center line of a bowling alley and pin indicating means having solenoid operated markers adapted to project from the device in correspondence with bowling pins standing after each ball is bowled in response to light beams reflected by the standing pins.

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