Oct. 14, 1952 H. S. JOHNS ET AL 2,613,933

PHOTOELECTRIC CELL CONTROL FOR BOWLING ALLEYS

Filed March 18, 1950

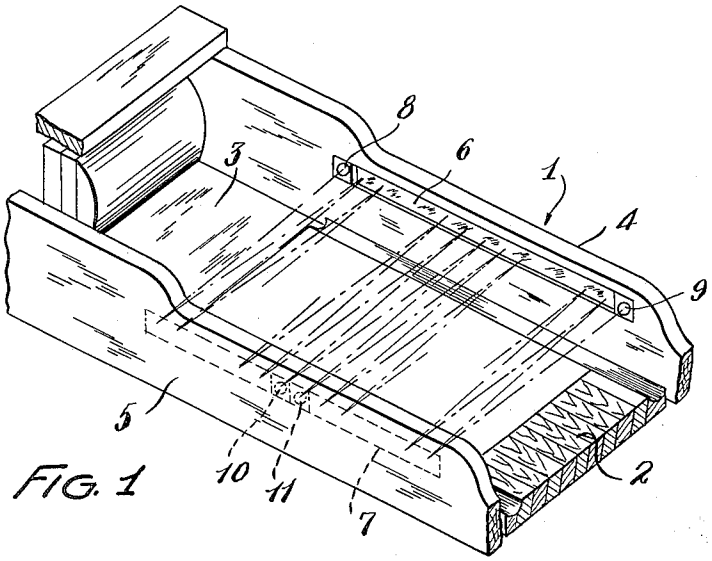


FIG. 1

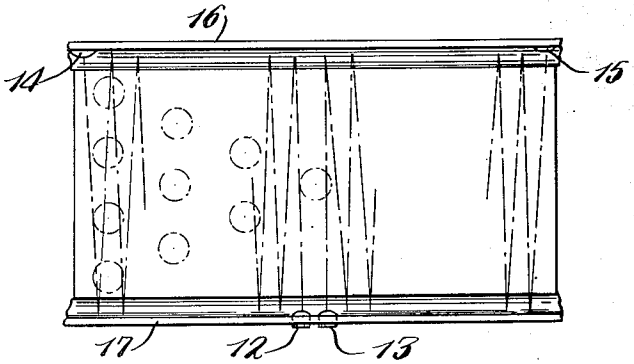


FIG. 2

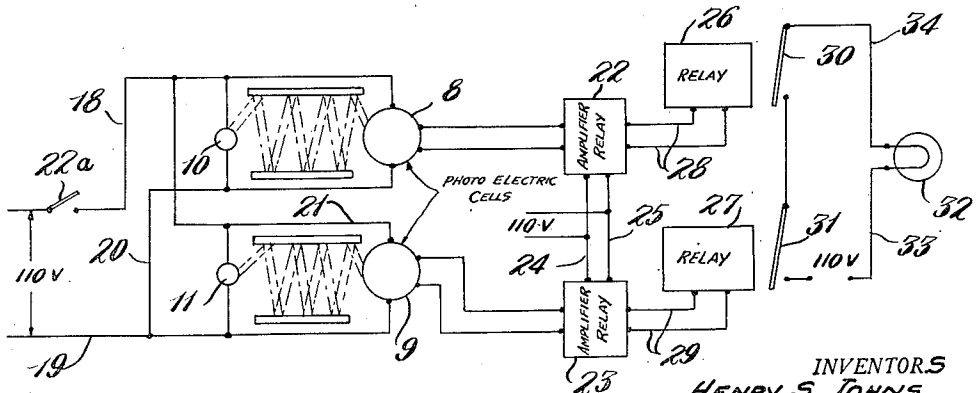


FIG. 3

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Patented Oct. 14, 1952

2,613,933

UNITED STATES PATENT OFFICE

2,613,933

PHOTOELECTRIC CELL CONTROL FOR BOWLING ALLEYS

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Application March 18, 1950, Serial No. 150,362

7 Claims. (Cl. 273—54)

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This invention relates to a bowling alley, and particularly to photo-electric cells and means associated therewith for controlling certain actions around a bowling alley, or for indicating certain conditions in a bowling alley dependent upon whether any pins are standing upright on the alley.

Heretofore photo-electric cells have been used in and around bowling alleys for indicating if fouls are committed by the bowlers, or for indicating what pins in the alley are standing.

The general object of the present invention is to provide a novel photo-electric cell means in a bowling alley for indicating whether or not any pins are standing upright on the alley.

Another object of the invention is to provide one or more photo-electric cells in a bowling alley that are actuated by a light beam or ray which is reflected transversely of the bowling alley progressively thereof in the pin receiving zone of the alley.

Another object of the invention is to provide photo-electric cell means in a bowling alley which means are particularly suited for use with automatic pin setting apparatus.

Still another object of the invention is to provide means in a bowling alley for closing a desired control circuit to indicate when a given condition exists in the bowling game.

Yet another object of the invention is to provide a relatively inexpensive, uncomplicated, positive acting, sturdy apparatus in a bowling alley, which apparatus is controlled by the condition of whether or not all pins on the alley have been knocked down.

Another object of the invention is to provide one or more photo-electric cell means used in combination with a plurality of mirrors positioned on opposite transverse sides of the alley and defining a plane that is preferably parallel to the surface of the bowling alley and positioned at a predetermined height above the alley less than the height of pins standing thereon.

The foregoing and further objects and advantages of the invention will be more completely understood as the following specification is read.

Reference now should be had to the drawings, wherein:

Fig. 1 is a perspective view of the pin receiving portion of a bowling alley and other means associated therewith embodying the principles of the present invention;

Fig. 2 is a plan of a portion of the alley shown in Fig. 1; and

Fig. 3 is a representative circuit wiring diagram of the apparatus of Figs. 1 and 2.

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The present application is a continuation-in-part of our copending application Ser. No. 569,962 upon Automatic Means for Operating Bowling Apparatus or Systems.

The details of the structure shown in the drawings include a bowling alley which is indicated generally by the numeral 1 with only an end portion of the alley being shown which is the portion of the alley on which the pins are positioned. The alley 1 includes a floor 2 which terminates in a pit 3 into which knocked down pins and the bowling balls normally are received. The bowling alley has a pair of sidewalls 4 and 5 positioned at the lateral margins of the bowling alley and preferably extending substantially normally with relation to the floor 2.

As an important feature of the invention, a pair of elongate mirrors 6 and 7 are suitably secured to, or embedded in the sidewalls 4 and 5 in parallel but opposed relation. The mirrors 6 and 7 define a plane which preferably is parallel to the surface of the floor 2 and is positioned thereabove a distance less than the height of any bowling pins to be received on the alley but greater than the width or depth of any pins normally received on the floor 2 so that the mirrors are above any pins that might be on the alley in a knocked-down or lying down position. The mirrors 6 and 7 may be made from any conventional material and they may even be made from material such as stainless steel so that they are adapted to stand blows and impacts to which portions of bowling alleys normally are subjected. In practice, the mirrors may be set about 9 to 10 inches above the parallel with the floor 2 for 10-pin bowling.

The position of the pins on the bowling alley is indicated in Fig. 2 and it will be noted that the mirrors 6 and 7 extend over a length of the bowling alley slightly greater than the length thereof normally occupied by pins in a bowling game. In fact, the mirrors are of such length that they extend to a point normally beyond that on which the No. 1 pin of a bowling alley is spotted so that a pin which might accidentally be left standing in a position in advance of the No. 1 spot on the alley will be positioned between the front end portions of the mirrors 6 and 7.

As an important element of the present invention, a pair of photo-electric cells, or electric eyes 8 and 9 are positioned on or suitably secured to the sidewall 4 at opposite ends of the mirror 6 and these photo-electric cells are adapted to be energized by light rays, or a light beam which is produced by suitable light pro-

ducing means, such as bulbs 10 and 11 that are positioned on the opposed sidewall 5 at the center portion of the mirror 7, which mirror may be interrupted in the portion thereof in which the light bulbs or other light generating means 10 and 11 are positioned. The light producing means used in the invention are adapted to produce a light beam, or light rays which are directed transversely of the bowling alley 1 in the plane defined by the mirrors 6 and 7. Such light beam is adapted to be reflected transversely of the bowling alley by the mirrors 6 and 7 and to be advanced progressively along the length of the alley with each transverse reflection of such light beam or rays. It has been determined that the beam should make an angle of approximately 1° and 33'' with a vertical plane intercepting the mirrors 6 and 7 at right angles to the surfaces thereof. By such angular relationship of the transmitted light beam and the mirrors, it will be insured that not only will any pin which may be left standing on the floor 2 interrupt such reflected light beam, but such light beam as reflected back and forth between the mirrors will pass over the shortest distance possible between the light producing means and the cells 8 and 9 in order to actuate such photo-electric cell. That is, the angle of advance of the light beam is set at the maximum value at which such light beam can be reflected back and forth across the alley and still be certain to strike any pin standing on the alley.

A conventional wiring circuit for the apparatus of the invention is indicated in Fig. 3.

Fig. 2 of the drawings illustrates a modification of the apparatus of the invention wherein photo-electric cells 12 and 13 are positioned at the center portion of the pin receiving zone of the bowling alley of the invention and these cells are adapted to receive light rays or beams that are produced by light producing means 14 and 15 that are secured to the opposite sidewall or kick-back 16 of the bowling alley of the invention from the sidewall or kick-back 17 of the bowling alley with which such photo-electric cells 12 and 13 are associated.

It will be appreciated that in some instances it may be desired to provide only one photo-electric cell or equivalent device that would be positioned adjacent one end of the elongate mirrors of the invention. Then the light generating means of the invention could be associated with either side plate portion of the bowling alley and generate a light beam that would be reflected back and forth along the bowling alley over the entire pin receiving zone thereof for transmission ultimately to the photo-electric cell means to be actuated thereby.

In the representative circuit diagram of the invention illustrated in Fig. 3, a pair of power leads 18 and 19 connect to a suitable source of electrical energy. The power lead 18 connects to one side of the light generating or producing means 10 and to one power supply side of the photo-electric cell 8 whereas an auxiliary power supply lead 20 connects to the power lead 19 and couples it to the opposite sides of such members or means. Likewise, a connector lead 21 connects to the power supply lead 18 and couples it to one side of each of the photo-electric cell 9 and the light generating means 11 whereas the opposite sides of such devices are coupled to the power lead 19 whereby these members will be continuously actuated so long

as a suitable control switch 22a provided in the lead 18 is closed.

Normally the photo-electric cells of the invention will be used to control some kind of an operative circuit which is associated with the bowling alley of the invention, although these photo-electric cell means could be used merely as indicator means and have an indicating circuit connected thereto, as desired, dependent upon whether the apparatus of the invention is used in the manual type of pin setting apparatus or is used in an automatic pin setter apparatus, and upon the desired relationship between the photo-electric cell means and the remainder of the bowling control apparatus used therewith.

In the present instance, the photo-electric cells 8 and 9 are shown coupled to amplifier relays 22 and 23 that are themselves connected to a suitable source of energy by leads 24 and 25 so that whenever the cells 8 and 9 are actuated, they in turn will actuate the control or amplifier relays 22 and 23 which themselves effect the desired control in the operative circuit used in combination with the means of the invention. Thus the relay 22 is shown coupled to an operative relay 26, and the relay 23 is coupled to an operative relay 27 by pairs of leads 28 and 29, respectively. The relays 26 and 27 in turn control switches 30 and 31 that are provided in an operative circuit formed by leads 33 and 34 that connect means, such as an indicator light bulb 32 to a power source so that such bulb will be illuminated when the switches 30 and 31 are closed. Obviously, any other desired device can be substituted for the bulb 32 to be operated or actuated, or closed etc. when the switches 30 and 31 are closed. Obviously only one such switch will be provided in a circuit having only one photo-electric cell used to receive light rays or a beam from one light generating member used in the apparatus of the invention. Another circuit control of the invention is shown in our said application Ser. No. 569,962.

In some instances it may be desirable to use a plurality of short mirrors rather than elongate mirrors, as shown.

From the foregoing it will be realized that a sturdy, effective apparatus is provided in a bowling alley for indicating that all the pins on the alley are down, or for controlling an electric circuit at such time, as desired so that the objects of the invention are realized.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention as defined by the appended claims.

What we claim is:

1. In a bowling alley having a pin positioning area therein, sidewall means positioned at the lateral margins of the alley and extending substantially normally to the surface thereof, said sidewall means being at the pin receiving area of the alley, an elongate mirror secured to each of said sidewall means parallel to the longitudinal axis of the alley at a vertical distance therefrom less than the height of any pins received thereon and greater than the width of any such pins, said mirrors being opposed to each other, light producing means for supplying a beam of light carried by one of said sidewall means in horizontal alignment with said mirrors, said light

means producing a light beam directed onto one of said mirrors and reflected back and forth therebetween, said light beam being at an angle of about 1° 33'' with a plane normal to the surfaces of said mirrors, a photo-electric cell carried by one of said side wall means in horizontal alignment with said mirrors for receiving said light beam when uninterrupted, and an operative circuit connected to and at least partially controlled by said photo-electric cell.

2. In a bowling alley having a pin positioning area therein, sidewall means positioned at the lateral margins of the alley at the pin receiving area of the alley, an elongate mirror secured to each of said sidewall means parallel to the longitudinal axis of the alley at a vertical distance therefrom less than the height of any pins received thereon and greater than the width of any such pins, said mirrors being opposed to each other, light producing means for supplying a beam of light in a plane defined by said mirrors, said light producing means producing a light beam directed onto one of said mirrors at a slight angle to a plane normal to the surfaces of said mirrors, a photo-electric cell carried by one of said sidewall means in alignment with said mirrors for receiving said light beam when transmitted a predetermined distance along said alley, and an operative circuit connected to and controlled by said photo-electric cell.

3. In a bowling alley having a pin positioning area therein, sidewall means positioned at the lateral margins of the alley at the pin receiving area of the alley, an elongate mirror secured to each of said sidewall means parallel to the longitudinal axis of the alley at a vertical distance therefrom less than the height of any pins received thereon and greater than the width of any such pins, said mirrors being opposed to each other and defining a plane, light producing means for supplying a beam of light and directing it onto one of said mirrors to be reflected back and forth therebetween progressively along the alley, said light beam being interrupted by any pin standing on the alley in the pin receiving area thereof, and a photo-electric cell positioned in the plane defined by said mirrors for receiving said light beam when uninterrupted.

4. In a bowling alley, light producing means, mirror means for reflecting a beam of the light transversely of the alley and progressively along same at the pin receiving zone thereof, said light producing means and mirror means positioning the light beam vertically above any fallen pins on the alley and below the tops of any standing pins on the alley, a pin on the alley interrupting such reflected light beam, photo-electric cell means positioned to receive said light beam when reflected along a predetermined length of the alley, and circuit means controlled by said photo-electric cell means.

5. In a bowling alley having a pin receiving zone therein, light producing means, means for reflecting a beam of the light transversely of the alley and progressively along same at the pin receiving zone thereof, said light producing means and mirror means positioning the light beam vertically above any fallen pins on the alley and below the tops of any standing pins on the alley, a standing pin on the alley interrupting such reflected light beam, and photo-electric means positioned to receive said light beam when uninterrupted.

6. In a bowling alley having a pin positioning area therein, sidewall means positioned at the lateral margins of the alley at the pin receiving area of the alley, an elongate mirror secured to each of said sidewall means parallel to the longitudinal axis of the alley at a vertical distance therefrom less than the height of any pins received thereon and greater than the width of any such pins, said mirrors being opposed to each other, a plurality of light producing means provided at opposed ends of one of said mirrors for supplying a beam of light in a plane defined by said mirrors, said light producing means producing a light beam directed axially inwardly onto one of said mirrors at a slight angle to a vertical plane normal to the surfaces of said mirrors, and a pair of photo-electric cells positioned at the middle of the second of said mirrors and each controlled by light rays from one of said light producing means.

7. In a bowling alley having a pin positioning area therein, sidewall means positioned at the lateral margins of the alley at the pin receiving area of the alley, an elongate mirror secured to each of said sidewall means parallel to the longitudinal axis of the alley at a vertical distance therefrom less than the height of any pins received thereon and greater than the width of any such pins, said mirrors being opposed to each other, a plurality of light producing means provided at the center of one of said mirrors for supplying a beam of light in a plane defined by said mirrors, said light producing means producing a light beam directed onto one of said mirrors at a slight angle to a vertical plane normal to the surfaces of said mirrors, and a photo-electric cell positioned at each end of the second of said mirrors and each controlled by light rays from one of said light producing means.

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