Dec. 22, 1942. J. E. BANCROFT 2,305,661

FOUL INDICATOR FOR BOWLING ALLEYS AND THE LIKE

Filed July 1, 1940

Fig. 1.

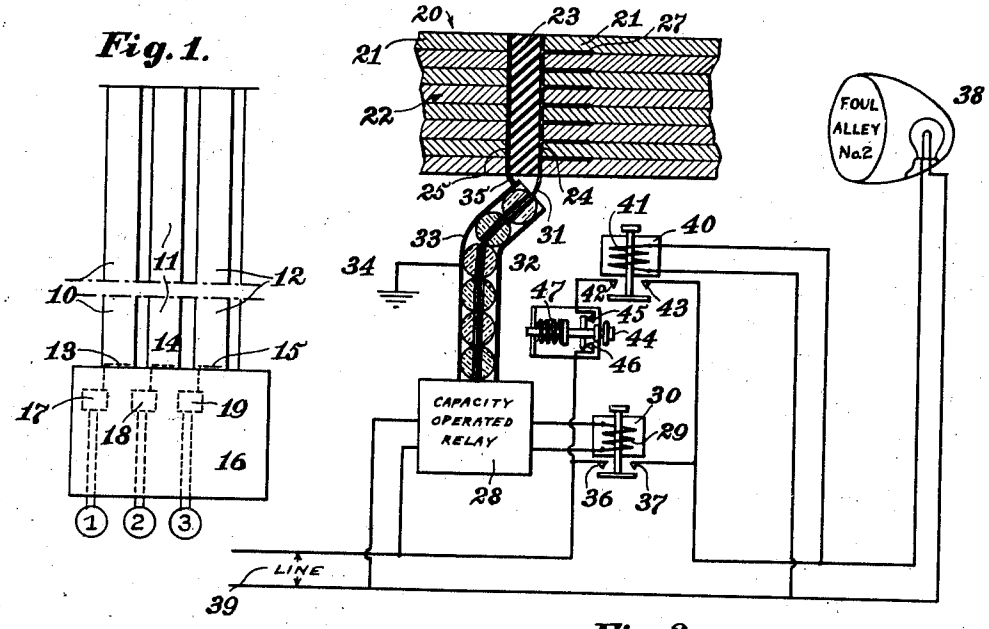


Fig. 2.

Fig. 3.

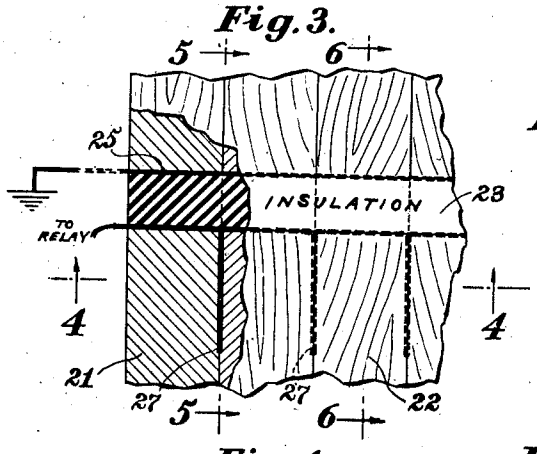


Fig. 4.

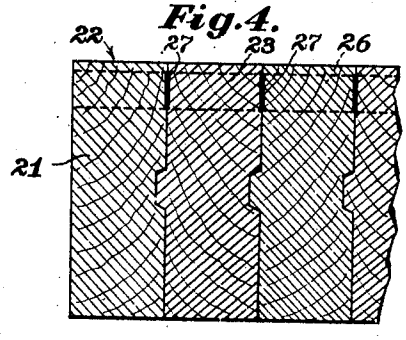


Fig. 5.

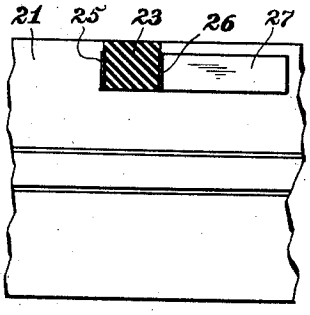
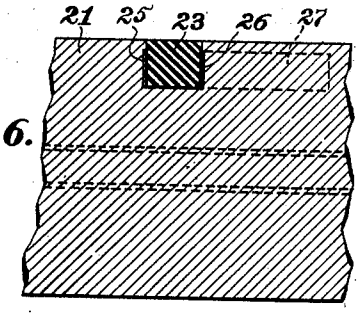


Fig. 6.



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FOUL INDICATOR FOR BOWLING ALLEYS AND THE LIKE

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Application July 1, 1940, Serial No. 343,398

11 Claims. (Cl. 273—50)

This invention relates to an arrangement, to be employed in games or sports such as bowling where a line is marked off beyond which the player is not permitted to cross without committing a foul and for which foul he is generally penalized, whereby the fact that the foul line has been crossed is so indicated that there can be no dispute about the question of whether or not the foul line has been crossed. I have herein illustrated the application of my invention to a bowling alley, although it will be understood that the invention as to its various phases is capable of application to other types of sports, games, or the like, where such features serve usefully.

The general object of my invention is the provision of an arrangement which is made effective for its purposes entirely by the position of the player with reference to the foul line, and is not dependent upon contact or pressure or weight of the player, but is entirely independent of such factors.

Among the more particular objects of my invention is the provision of an arrangement of the character described in which an indicating device is controlled by the electrical capacity effects of a player as he approaches the foul line or steps beyond it into an area that constitutes a "foul area."

Also among the objects of my invention is the provision in an arrangement of the character described of means for maintaining a foul indicating device in its operative condition for an indefinite period after the commission of the foul, and further the provision in such an arrangement of manually controlled means for rendering said maintaining device inoperative.

These objects and such other objects as will hereinafter appear or be pointed out are attained in the illustrative embodiment of my invention shown in the drawing, in which:

Figure 1 is a plan view, more or less diagrammatic, and with portions broken away, showing the application of my invention to a bowling alley;

Figure 2 is a diagrammatic view showing the details of one illustrative embodiment of my invention, as applied to a bowling alley;

Figure 3 is a plan view on an enlarged scale of a portion of a bowling alley bed, showing the foul line thereof, and the antenna and the shield of the embodiment of Figure 2 in position relative to the foul line; and

Figures 4, 5 and 6 are respectively sections on the lines 4—4, 5—5, and 6—6 of Figure 3, looking in the directions of the respective arrows.

My invention generally comprises an arrangement whereby the function of the device is dependent entirely upon the fact that the presence of the human body affects the capacity of the apparatus associated with the bowling alley and the change in position of the body causes changes in that effect. Stated differently, my invention comprises an arrangement based on the operating principle that a person quickly approaching an antenna (which may be located at the foul line of a bowling alley or the like), will cause a change in the natural capacity of the antenna and its circuit. Apparatus is provided which responds to this change in capacity to operate an indicating device, which may be an audible, visible or other signal or a recording or other device.

In Figure 1, I have shown a bowling installation comprising alleys 10, 11, 12, having each a foul line 13, 14 and 15 respectively positioned at the beginning thereof and separating it from the space 16 in which the players stand. Associated with each alley is an indicating system, 17, 18 and 19 respectively, having as part thereof an indicating or recording device, 1, 2, 3 respectively, such as an audible, visible or other signal, or a recording arrangement, which will indicate or record the fact that a player has stepped over the foul line. Since each alley has its individual system, the indicators 1, 2, 3, serve to point out in which particular alley the fault occurred.

The remaining figures of the drawing serve to illustrate one of the systems associated with one of the alleys of Figure 1, and by way of example the system 17 associated with the alley 10 has been so illustrated.

In Figure 2 the elements constituting the system 17 are shown diagrammatically in their operative relation, while Figures 3 to 6 show the antenna of Figure 2 and its mounting on an enlarged scale.

The alley 10 has its bed 20 composed, in the conventional manner, of strips of wood 21 laid with their edges 22 uppermost, these exposed edges constituting the surface of the alley bed. They are shown as tongued and grooved to interfit them properly, in the conventional manner.

Sunk into a groove in the alley bed, transversely thereto, and flush with its upper surface, is a bar of insulating material 23, which constitutes the foul line of the alley, and at the same

time acts as a dielectric separating the antenna 24 from a grounded shield 25.

The antenna 24 is shown as in the form of a plate 26 placed against the forward side of the bar 23 and between it and the wall of the groove in the alley bed. For this purpose it is preferably made very thin so that it may be positioned between the bar 23 and the woodwork of the alley bed without the necessity of providing a groove for it, or of alternately leaving a wide crack between these parts. It will be observed that the antenna does not extend to the surface of the alley bed but is spaced therefrom so as to prevent contact of the player with any portion thereof. I have found a spacing of about one-eighth of an inch below the surface of the alley bed to give satisfactory results.

Branching off from the plate 26 at spaced intervals are a plurality of plates 27, that extend between adjoining strips 21, and for that reason are also preferably made thin. These are also sunk below the surface of the alley bed. The shield 25 also has its uppermost portions below the top surface of the alley bed.

These plates 27 and the plate 26 are made of electrically conducting material, such as metal, and constitute an electrically conducting system which is connected to a capacity operated relay 28, so arranged that as the body of a player on the alley approaches within a predetermined distance of the antenna 24 (or the foul line 23) it will close the circuit of the solenoid 29 of an electromagnetic switch 30, which will thereupon operate to close an indicating or recording circuit, as will be more fully explained hereinafter.

It will be observed that the antenna system 26, 27 constitutes a two-dimensional system that is distributed in an area, which may be termed the "foul area," rather than in a line. Whenever the player's body is within said area the foul signal will operate. By making the length of the plates 27 sufficient the signal will operate whenever the player steps over the foul line, no matter how long his step.

The relay 28, the details of which are not disclosed, because they constitute no part of my invention, may be of any of the known types that are adapted to perform the desired function, and it is shown connected to the antenna 24 by the lead wire 31. The latter is passed through the insulating beads 32 which are surrounded by a conducting shield 33, which may be of metal and which is grounded, as shown at 34. The shield 25, already mentioned, is shown grounded through the shield 33 to which it is shown connected as at 35.

The shield 25 serves to prevent the contact of persons with the wire 31. In order to minimize the effect which it may have in reducing the sensitivity of the antenna it may be made of large diameter, whereby the capacity effect of the lead-in wire 31 is reduced.

The switch 30 is adapted to interconnect a pair of contacts 36 and 37 and thereby to close the circuit of an indicating device 38, shown as in the form of a light, the latter being thereby connected to a source of electricity 39, to which also the relay 28 is connected.

The relay 28 is of a type which releases the switch 30 a predetermined time after energization takes place, this action being automatic and taking place without control or intervention of any kind.

Since it is desirable to maintain the indicating device 38 in operation until the scorer has noted the foul, which may be sometime after the foul occurs, I have shown means for this purpose in the form of a second electromagnetic switch 40 having its solenoid 41 connected in parallel to the indicating device 38 whereby the circuit of the latter may remain closed although the deenergization of switch 30 causes a disconnection of the contacts 37 and 36.

It is of course necessary to provide means to deenergize the circuit of the device 38 so that it will be restored to an inactive condition and be ready to indicate subsequent fouls. For this purpose I have shown means in the form of a push button 44, which will normally maintain connection between contacts 45 and 46, but when operated manually will break this connection, thereby deenergizing the solenoid 41 and breaking the circuit of the indicating device 38 through contacts 42 and 43.

When the button 44 is released, it will be caused to connect the contacts 42 and 43, as by means of a spring 47 constituting a part of the switch.

It will be observed that the device as just described is fool-proof in that a foul will be indicated even though the button 44 is in its depressed position by accident or otherwise, in which event it acts to break the by-pass circuit 45, 46, 42, 43, because the relay 28 will not be prevented by this break from energizing the circuit of the indicating device.

The operation of the illustrative embodiment of my foul indicating device will now be briefly summarized.

When a player uses the alley 10 he stands in the space 16 and during the game he will approach the foul line 13 as he delivers the ball. Should he approach within a predetermined forbidden distance of the foul line 13, the relay 28 will function to energize the switch 30 which closes the circuit of light 38 and at the same time closes the by-pass through contacts 42 and 43 because of the parallel connection between light 38 and switch 40. The light 38 will now remain on until the scorer, having noted the foul, pushes the button and deenergizes the switch 40 so as to open the circuit of light 38.

Since according to the standard rules of bowling a foul is committed when a player contacts the gutter beyond the foul line, or the wall sometimes found adjacent the foul line, my invention also contemplates extending the antenna so that it crosses the gutter, or where there is a wall so that it extends up the wall. In the latter case I have found that if the antenna, is carried up the wall a distance of four and one-half feet, that ordinary requirements are met.

While I have herein disclosed one illustrative embodiment of my invention, it will be understood that the same may be embodied in many other forms without departing from the spirit thereof as will be obvious to those skilled in the art. It will further be understood that the disclosure herein is by way of illustration merely and is not to be interpreted in a limiting sense, and that I do not limit myself other than as called for by the prior art.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is:

1. In a bowling alley bed: means for operating an electrical indicating circuit, said means comprising a foul line in the form of a bar of insulating material sunk into the bed of the alley transversely thereacross and flush with the sur-

face thereof, an antenna in the form of a flat vertical plate of conducting material on one side of said bar and having its upper edge below the level of the alley bed, a shield in the form of a vertical plate on the opposite side of said bar and a plurality of vertical conducting plates branching out from said antenna and extending between the alley bed strips, said plates having their upper edges below the surface of the alley bed, and said shield being grounded.

2. In a bowling alley bed, means for operating an electrical indicating circuit, said means comprising a foul line in the form of a bar of insulating material sunk into the bed of the alley transversely thereacross and flush with the surface thereof, an antenna in the form of a flat vertical plate of conducting material on one side of said bar and having its upper edge below the level of the alley bed, and a plurality of vertical conducting plates branching out from said antenna and extending between the alley bed strips, said plates having their upper edges below the surface of the alley bed.

3. In a bowling alley, an alley bed constituted by boards laid side by side in substantial contact with each other, and an antenna of electrically conducting material having portions thereof laid between adjacent boards so as to leave them in substantial contact with each other, and so as to leave a space between said antenna and the upper surface of said alley.

4. In a bowling alley bed: means for operating an electrical indicating circuit, said means comprising insulating material sunk into the bed of the alley, extending in the general direction of the foul line and flush with the surface thereof, an antenna comprising a conductor positioned between said insulating material and the alley bed and below the surface of the alley bed, and at least one conductor branching off from said first mentioned conductor and sunk into said alley bed below the surface thereof, whereby said antenna is distributed in two dimensions.

5. In a bowling alley bed: means for operating an electrical indicating circuit, said means comprising insulating material sunk into the bed of the alley, extending in the general direction of the foul line and flush with the surface thereof, an antenna comprising a conductor positioned between said insulating material and the alley bed and below the surface of the alley bed, and at least one conductor branching off from said first mentioned conductor and sunk into said alley bed below the surface thereof, whereby said antenna is distributed in two dimensions, and a shield in the form of a conductor positioned between said insulating material and the alley bed below the surface thereof, and spaced from said antenna, said shield being grounded.

6. In a bowling alley bed: means for operating an electrical indicating circuit, said means comprising insulating material sunk into the bed of the alley, extending in the general direction of the foul line and flush with the surface thereof, an antenna comprising a conductor positioned between said insulating material and the alley bed and below the surface of the alley bed, and a plurality of parallel conductors branching off from said first-mentioned conductor and extending longitudinally of said alley bed and sunk into said alley bed below the surface thereof, whereby said antenna is distributed in two dimensions.

7. In a bowling alley, an antenna system distributed in directions transversely and longitudinally of the alley bed and parallel to and slightly below the surface of the alley bed, said alley bed being constituted by wooden boards laid side by side and running longitudinally thereof, said antenna system commencing at and extending forwardly of the foul line of the alley and comprising electrical conductors sunk into the wooden bed of the alley and extending in the direction of the boards thereof, forwardly from the foul line, and an electrical conductor connecting said first-mentioned conductors.

8. In a bowling alley, an antenna system distributed in directions transversely and longitudinally of the alley bed and parallel to and slightly below the surface of the alley bed, said alley bed consisting of strips of material laid side by side and extending longitudinally of the alley bed, said antenna system commencing at and extending forwardly of the foul line of the alley and comprising electrical conductors inserted in the cracks between the strips of the alley bed and extending longitudinally thereof forwardly from the foul line, and an electrical conductor connecting said first-mentioned conductor.

9. In combination in a bowling alley, an alley bed and an antenna comprising conductors extending in a longitudinal direction along said alley bed in spaced parallel relation to each other and below the upper surface thereof, and electrically operated means associated with said antenna for indicating the presence of a player within a predetermined distance from said antenna.

10. A foul indicator for bowling alleys comprising: a capacity operated relay, means comprising a conductor positioned parallel and adjacent to the foul line of the bowling alley and connected to said relay so that changes in the capacity of the conductor affect the relay, and signalling means rendered active by the relay when it is affected to a predetermined extent by changes in the capacity of said conductor and a grounded conductor positioned adjacent to said foul line and extending in parallel, spaced relation to said first conductor.

11. In combination in a bowling alley, an alley bed, a foul line and an antenna adjacent to said foul line, a capacity-operated relay, an indicating circuit, a switch operated by said relay for opening and closing said indicating circuit, a lead wire connecting said antenna and said relay, an electromagnetic holding switch in said indicating circuit in parallel with said first mentioned switch and with said indicating circuit, said switch having its actuating electromagnet connected in parallel with said indicating circuit so that said holding switch closes when said first switch closes and remains closed after said first switch opens and a normally closed manually operable push button in series with said holding switch and adapted to open said indicating circuit and said actuating electromagnet and thereby to restore said indicating circuit to its inactive position.

JAMES E. BANCROFT.