May 28, 1963 E. K. MENTZER ET AL 3,091,457

BOWLING GAME APPARATUS

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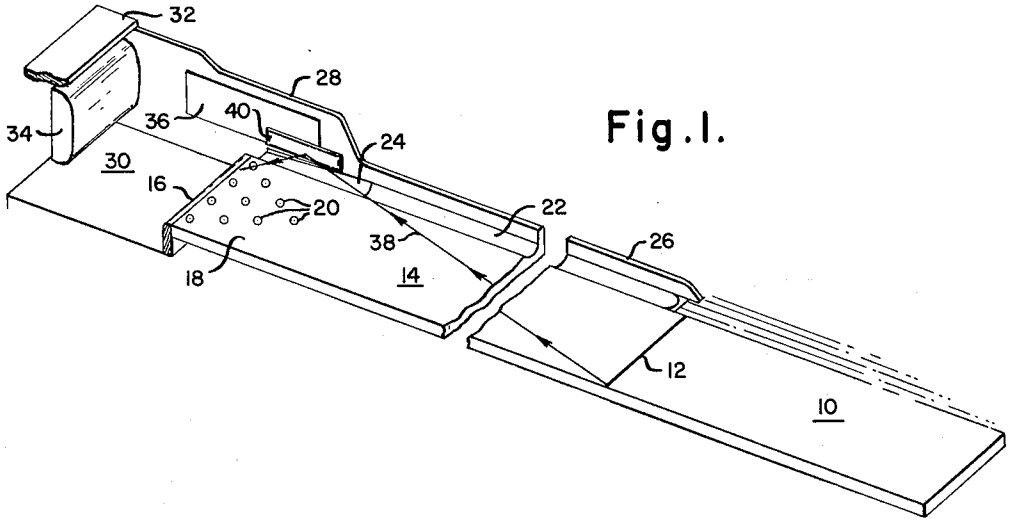



Fig. 1.

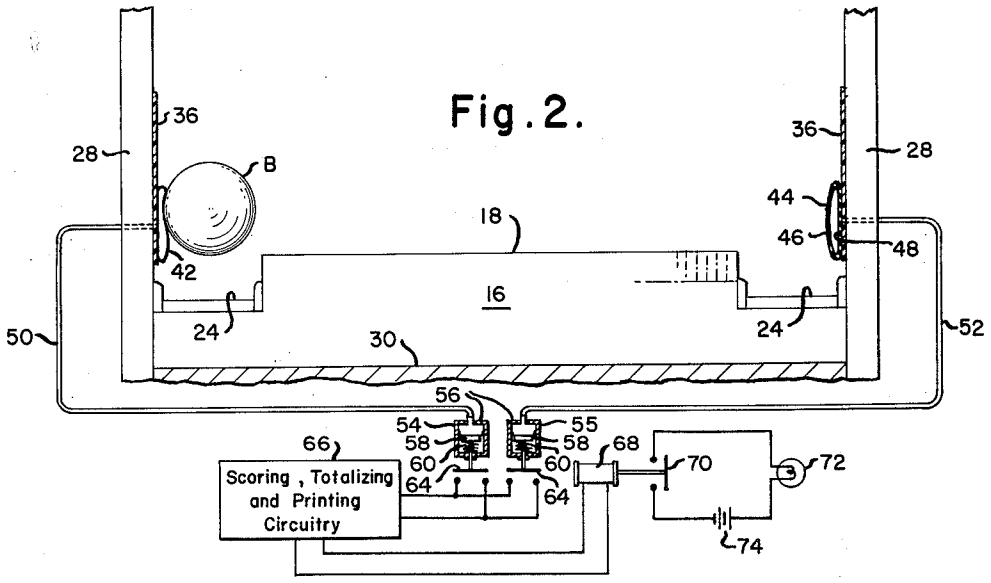
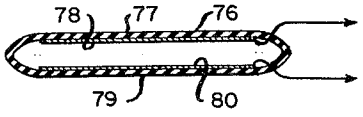



Fig. 2.

Fig. 3.




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Fig. 4.

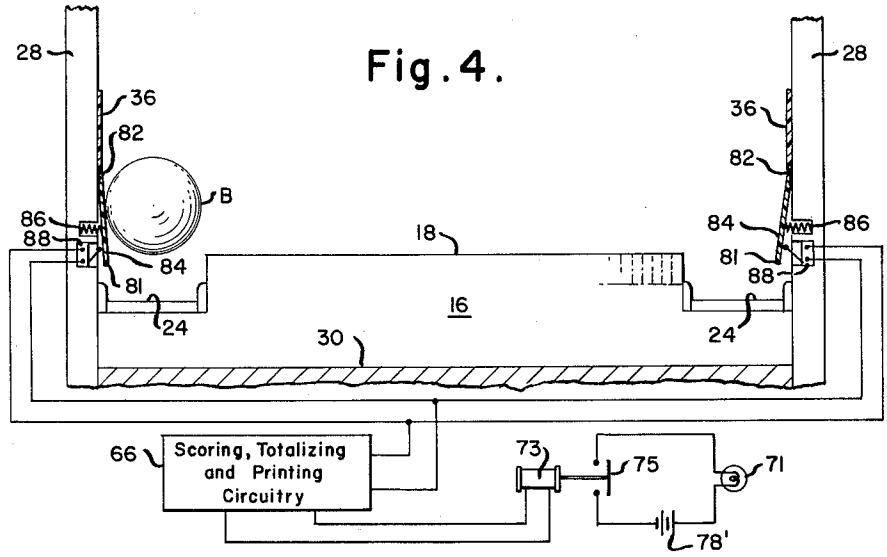
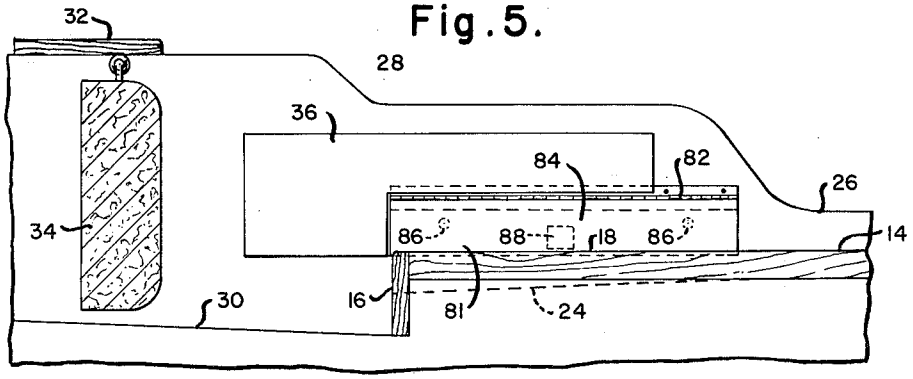



Fig. 5.




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United States Patent Office 3,091,457 Patented May 28, 1963



3,091,457

# BOWLING GAME APPARATUS

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Filed Nov. 2, 1961, Ser. No. 149,664
12 Claims. (Cl. 273—54)

This invention relates to bowling game apparatus, and more particularly to apparatus for automatically indicating illegal pinfall which results from pins being knocked down by a ball which leaves the bowling alley before reaching the pins.

Although not limited thereto, the present invention is particularly adapted for use with a device for automatically detecting, registering, totalizing and printing the score in a bowling game, such as that shown in copending application Serial No. 38,091, filed July 7, 1961. In such a system the pinfall is initially detected and thereafter registered preparatory to a totalizing and printing operation. As is known, any pinfall is illegal under the rules of the American Bowling Congress resulting from a ball which leaves the alley before reaching the pins. In the usual case, such illegal pinfall occurs when a bowler attempts to knock down an end pin by an angle delivery from one side of the alley to the other. In such a delivery it sometimes happens that the ball will leave the alley adjacent the pin deck and rebound off the kickback plate to knock down pins. Such pinfall, of course, should not be counted in scoring the game; however the aforesaid automatic registering and totalizing apparatus, in and of itself, is not capable of distinguishing between ordinary pinfall and illegal pinfall of the type described above. Accordingly, in the absence of some type of apparatus for detecting the fact that the ball has left the alley before reaching the pins, the automatic scoring circuitry will count the illegal pinfall along with normal pinfall.

As an overall object, the present invention provides a system for detecting a bowling ball which leaves the alley before reaching the pins.

More specifically, an object of the invention is to provide a system for detecting illegal pinfall as a result of a bowling ball leaving the alley before knocking down pins.

Still another object of the invention is to provide means, in combination with an automatic bowling game scoring system, for disabling the scoring system to register illegal pinfall of the type described above.

In accordance with the invention, there is provided electrical switch apparatus having switch actuating means on the bowling alley kickback plates and extending along the entire length of the pin deck such that the switch apparatus will be actuated under the impact of a bowling ball at any point on the kickback plate adjacent the pin deck, together with electrical utilization apparatus responsive to actuation of the switch apparatus for indicating the fact that the ball has left the alley. The switch actuating apparatus may comprise an elastic inflated bladder which will compress under the weight of a bowling ball to actuate a pressure responsive switch, or the kickback plate adjacent the pin deck may be pivotally mounted, or supported on springs, such that it may move inwardly toward the kickback under the weight of a bowling ball to trip a limit switch or the like. Other switch actuating means may be used which are responsive to the impact of the ball adjacent the pin deck; but, in all cases, actuation of the switch will energize visual indicating means and/or will disable automatic registering and scoring apparatus from counting the pins which are knocked down after a ball rebounds from the kickback.



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 perspective view of a bowling alley showing the manner in which a ball may leave the alley and rebound to knock down pins;

FIG. 2 is a partially broken away end view of the alley of FIG. 1, showing one embodiment of the invention for detecting a ball which leaves the alley before knocking down pins;

FIG. 3 is an illustration of another embodiment of the ball-detecting apparatus of the invention;

FIG. 4 is an end view of the bowling alley of FIG. 1 illustrating another embodiment of the invention wherein the ball is detected by means of a pivoted kickback plate; and

FIG. 5 is a side view of the pivoted kickback plate shown in FIG. 4.

Referring now to the drawings, and particularly to FIG. 1, the conventional bowling alley shown comprises the usual approach area **10** which terminates at a foul line **12**. On the other side of the foul line is the alley proper **14** comprising tongue-and-groove bed stock laid on edge. The alley **14** terminates at a tail plank **16**, while ahead of the tail plank is a pin deck **18** having ten fiber pin spots **20** thereon. As will be understood, the pins are placed on the pins spots **20** during a bowling game either manually or by means of an automatic pin spotting machine, not shown. On each side of the alley **14** are round bottom gutters **22**, only one of such gutters being shown in FIG. 1. The gutters **22** extend from the foul line **12** to the pin deck **18**; while along the pin deck are gutters **24** which conventionally have flat bottom surfaces, these gutters **24** communicating with the end of gutters **22** as shown.

Separating successive alleys are division boards **26** which communicate with kickbacks **28**. The kickbacks extend along the length of the pin deck **18** as well as the pit **30** behind the tail plank. A cushion plank **32** extends between the tops of the kickbacks **28** and supports a cushion **34**, substantially as shown. On the side of each kickback **28** is a kickback plate **36** facing the pins on spots **20**.

In a bowling game, a bowler may attempt to knock down an end pin by an angle shot along the approximate path **38** shown in FIG. 1. It sometimes happens that the path of travel of the ball and its momentum are such that it will leave the alley before reaching the pins, rebound from the kickback **28** and then be deflected back onto the pin deck where it will knock down pins. Pins which are knocked down in this manner should, of course, not be counted in scoring the game.

As was mentioned above, the present invention is particularly adapted for use with an automatic scoring, totalizing and printing system for a bowling game of the type shown in copending application Serial No. 38,091, filed July 7, 1960. In such a system, the standing pins are detected after each ball is delivered in a bowling game, and the number of standing pins then subtracted from ten in electrical circuity to determine the number of fallen pins. The number of fallen pins is then automatically printed on a score sheet, and is also added to the cumulative number of fallen pins in previous frames of the bowling game in order to totalize the score preparatory to its being printed on the score sheet also. In the absence of some type of detecting means for indicating a condition such as that wherein the ball leaves the alley before knocking down pins, those pins knocked down illegally would be counted as normal pinfall by

the automatic scoring, totalizing and printing circuitry. In accordance with the present invention, means schematically indicated at **40** in FIG. 1, are provided for detecting a ball which leaves the alley before knocking down pins, the detecting means serving also to disable automatic scoring, totalizing and printing circuitry such that it will not count the illegal pinfall.

Referring now to FIG. 2, one type of detecting means is shown which comprises a pair of elastic bladders **42** and **44** which are secured to the sides of the kickbacks **28** just above the gutters **24** by any suitable means, not shown. Each bladder extends along the entire length of the pin deck from the tail plank **16** to the head pin and comprises an enclosure having side walls **46** and **48** of rubber or the like which will compress under the impact of a bowling ball B which leaves the alley before knocking down pins. Connected to the bladders **42** and **44** are tubes **50** and **52**, respectively, each of which communicates with an electrical pressure switch **54** or **55**. Each pressure switch **54**, **55** comprises a cylinder **56** which contains a reciprocable piston **58**, this piston being urged upwardly as shown in FIG. 2 by means of coil spring **60**. Each piston **58** is, in turn, connected to an electrical contact **64** which, when moved downwardly, completes a circuit to the automatic scoring, totalizing and printing circuitry **66**, shown in the aforesaid application Serial No. 38,091, to disable such circuitry from printing or totalizing the number of fallen pins when the ball leaves the alley before knocking down such pins.

As shown, the tubes **50** and **52** are connected to the cylinders **56** above the pistons **58**. Initially, each closed system comprising bladder **42** or **44** and its associated tube **50** or **52** may be inflated with pressure of inflation being such that it will not depress the spring **60** in and of itself. Furthermore, the springs **60** are such that even though flying pins strike the bladder **42**, for example, the impact of the pins will not be great enough to compress the spring **60** associated with that bladder and close its contact **64**. When, however, a bowling ball B, being of much greater weight and having a greater momentum than the pins, strikes either one of the bladders **42** or **44**, its associated spring **60** will be compressed to close the contact **64** and complete the disabling circuit to the automatic scoring, totalizing and printing circuitry **66**. At the same time, closure of either one of the contacts **64** will energize relay **68** to close its contact **70**, thereby energizing the lamp **72** through a source of potential, such as battery **74**, to visually indicate that a ball has left the alley before reaching the pins.

If desired, the closed system of bladders **42** and **44** and their associated tubes **50** and **52** need not be inflated. In this latter case, the strength of the flexible walls of the bladders **42** and **44** will be such that they will not deflect under the impact of a pin, but will deflect under the weight of a moving bowling ball to compress the springs **60** and close the contacts **64**. In this latter case, the walls **46** and **48** may be reinforced with tire chord or the like, if necessary.

Referring now to FIG. 3, the bladders **42** and **44** may be replaced by an arrangement comprising a rubber or other elastic device **76** having parallel, facing side walls **77** and **79**. Each of the facing side walls is lined, as shown, with strips of electrical conducting material **78** and **80**, the arrangement being such that when a bowling ball strikes the device **76**, one of its walls will compress to make contact between the strips **78** and **80**. These strips, in turn, will be connected in a circuit to the automatic scoring, totalizing and printing circuitry **66** of FIG. 2 such that the circuit will be disabled when the strips **78** and **80** make contact in response to a ball leaving the alley before knocking down pins. As with the bladders **42** and **44**, the walls of device **76** may be reinforced with tire chord if necessary to give them sufficient strength such that they will not collapse under the impact of a pin, but will nevertheless collapse to make contact between strips **78** and **80** under the impact of a bowling ball which rebounds to knock down pins.



Referring now to FIGS. 4 and 5, still another embodiment of the invention is shown wherein the lower portion **81** of each kickback plate **36** is hinged as at **82**, this lower portion extending beyond the main kickback plate shown in FIG. 5 so as to extend along the entire length of the pin deck from the tail plank **16** to the head pin. With the arrangement shown, there is provided a hinged flap **84** which is biased outwardly at its lower edge by means of coil springs **86**. Positioned behind each of the flaps **84** are limit switches **88**, the arrangement being such that when either flap is moved inwardly toward its kickback **28** in response to a bowling ball leaving the alley, the limit switch **88** will be closed to disable the automatic scoring, totalizing and printing circuitry **66**. At the same time, closure of either one of the limit switches **88** will energize relay **73** to close its contact **75**, thereby energizing lamp **71** through battery **78'** to visually indicate the fact that the ball has left the alley as in the embodiment of FIG. 2. As will be understood, the strength of springs **86** on either one of the flaps **84** must be such that they will not compress to trip the limit switch **88** under the weight of flying pins but will nevertheless be compressed to trip the switch in response to a bowling ball.

Although the invention has been shown in connection with certain specific embodiments, 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.

We claim as our invention:

1. In a bowling alley having a pin deck and at least one kickback at the side of the pin deck, the combination of means for detecting a ball which strikes the kickback and rebounds to knock down pins comprising electrical switch means actuable by a ball which strikes the kickback, and electrical utilization apparatus responsive to actuation of the switch means for indicating the fact that the ball has left the alley before knocking down pins.

2. In a bowling alley having a pin deck and a kickback on at least one side of the pin deck, the combination of means for detecting a ball which strikes the kickback and rebounds to knock down pins comprising electrical switch means mounted on said kickback and actuable by a ball which strikes the kickback and rebounds to knock down pins, and electrical utilization apparatus responsive to actuation of the switch means for indicating the fact that the ball has left the alley before knocking down pins.

3. In a bowling alley having a pin deck and at least one kickback at the side of the pin deck, the combination of means for detecting a ball which strikes the kickback adjacent the pin deck and rebounds to knock down pins comprising electrical switch apparatus having a switch actuating means extending along the entire length of the kickback adjacent the pin deck such that the switch apparatus will be actuated by the impact of a bowling ball at any point on the kickback adjacent the pin deck, and electrical utilization apparatus responsive to actuation of the switch apparatus for indicating the fact that the ball has left the alley.

4. In a bowling alley having a kickback on at least one side of the alley, the combination of means for detecting a ball which strikes the kickback comprising an inflated bladder of elastic material positioned on the side of the kickback and compressible under the impact of a bowling ball, an electrical pressure switch actuable in response to compression of the bladder, and electrical utilization apparatus responsive to actuation of the pressure switch for indicating the fact that a bowling ball has left the alley.

5. In a bowling alley having a pin deck and a kickback on at least one side of the pin deck, the combination of

means for detecting a ball which strikes the kickback adjacent the pin deck and rebounds to knock down pins, comprising an inflated bladder of elastic material positioned on the side of the kickback and extending along the entire length of the pin deck, said bladder being compressible under the impact of a bowling ball, an electrical pressure switch actuable in response to compression of the bladder, and electrical utilization apparatus responsive to actuation of the pressure switch for indicating the fact that a bowling ball has left the alley before knocking down pins.

6. In a bowling alley having a kickback on at least one side thereof, the combination of means for detecting a ball which strikes the kickback comprising an elongated elastic member positioned on the kickback and defining an enclosure with opposite side walls extending parallel to the kickback, strips of electrical conducting material on the opposite side walls, and means connecting said conducting strips in a circuit for indicating striking of a ball against the kickback, the arrangement being such that the elastic member will compress under the impact of a ball to contact said conducting strips to complete said indicating circuit.

7. In a bowling alley having a pin deck and at least one kickback on the side of the pin deck, the combination of means for detecting a ball which strikes the kickback adjacent the pin deck and rebounds to knock down pins, comprising an elongated elastic member positioned on the kickback and extending along the entire length of the pin deck, said elastic member defining an enclosure with opposite side walls extending parallel to the kickback, strips of electrical conducting material on the opposite side walls, said strips of electrical conducting material extending throughout the length of the pin deck, and means connecting said conducting strips in a circuit for indicating the impact of a ball against the detecting means, the arrangement being such that the elastic member will compress under the impact of a ball to contact said conducting strips and complete said indicating circuit.

8. In a bowling alley having a kickback on at least one side thereof, the combination of means for detecting a ball which rolls into the kickback comprising a horizontally movable plate on the kickback, spring means urging the plate toward the pin deck, limit switch means actuable upon movement of said plate away from the pin deck under the impact of a bowling ball, and circuit means responsive to actuation of the limit switch means for indicating the fact that ball has struck the kickback.

9. In a bowling alley having a pin deck and at least one kickback on one side of the pin deck, the combination of means for detecting a ball which strikes the kickback adjacent the pin deck and rebounds to knock down pins, comprising a horizontally movable plate on the kickback extending throughout the length of the pin deck, spring means urging said plate toward the pin deck, limit switch means actuable upon movement of said plate away from the pin deck under the impact of a bowling ball, and circuit means responsive to actuation of the limit switch means for indicating the fact that a ball has struck the kickback.

10. In a bowling alley having a kickback on at least one side thereof, the combination of means for detecting a ball which strikes the kickback and rebounds, comprising a plate member extending along the length of the pin deck and pivotally connected at its upper edge to the kickback, spring means interposed between the kickback and the lower edge of said plate member, limit switch means actuable upon pivotal movement of the lower edge of the plate member away from the pin deck in response to the impact of a bowling ball, and electrical utilization apparatus responsive to actuation of the limit switch means for indicating the fact that the ball has struck the kickback.

11. In a bowling alley having a pin deck, a kickback on at least one side of the pin deck, and apparatus for automatically registering pinfall and totalizing the score in a bowling game; the combination of means for disabling said registering and totalizing apparatus when a ball strikes the kickback and rebounds to knock down pins comprising electrical switch means actuable by a ball which strikes the kickback, and means responsive to actuation of the switch means for preventing said apparatus from registering and totalizing pinfall resulting from a ball which rebounds from the kickback.

12. In a bowling alley having a pin deck, at least one kickback at the side of the pin deck, and apparatus for automatically registering pinfall and totalizing the score in a bowling game; the combination of an electrical switch device having switch actuating means extending along the entire length of the kickback adjacent the pin deck such that the switch device will be actuated by the impact of a bowling ball at any point on the kickback adjacent the pin deck, and means responsive to actuation of the switch device for preventing said apparatus from registering and totalizing pinfall resulting from a ball which strikes the kickback and rebounds to knock down pins.

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