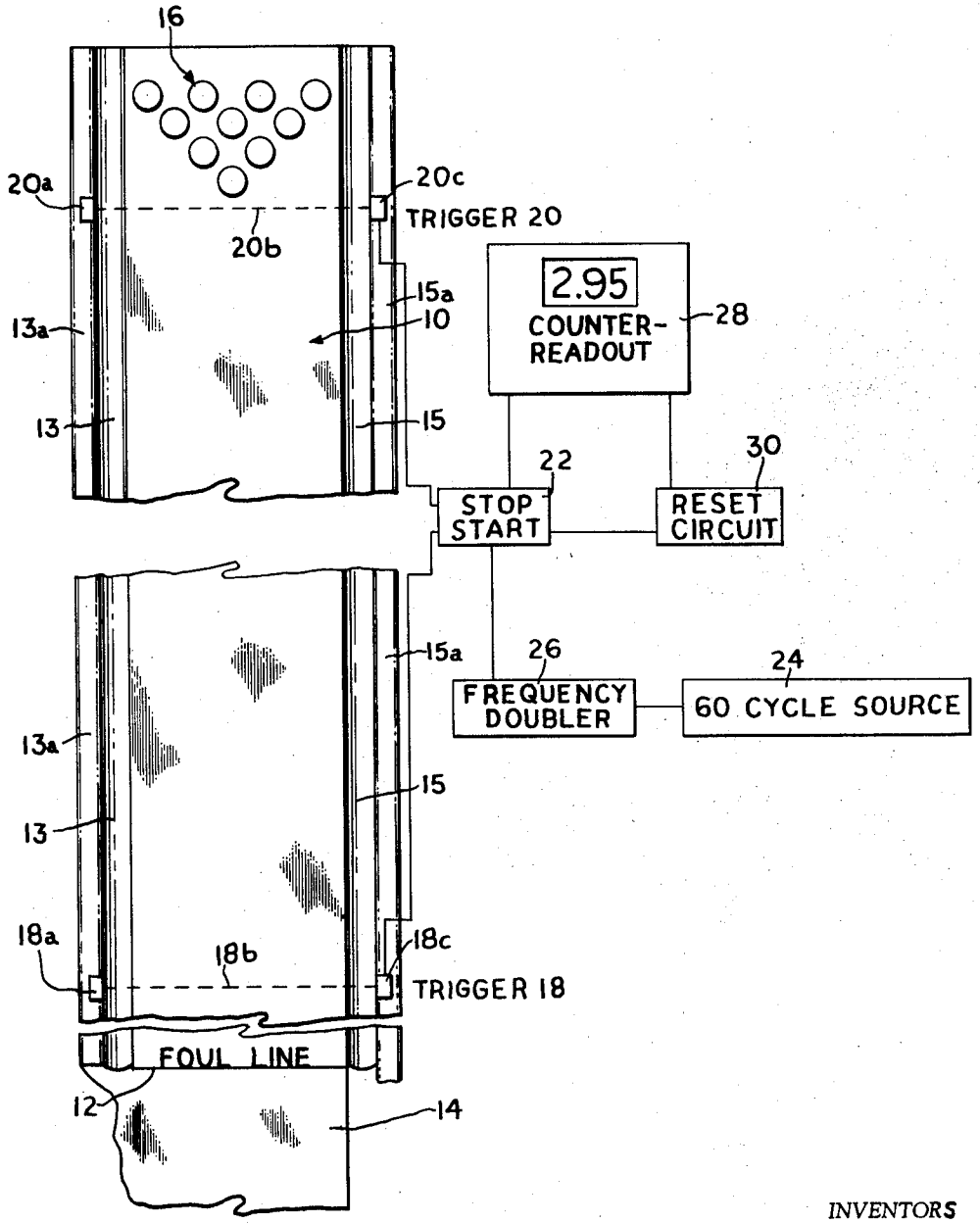
Aug. 18, 1964 J. H. MORRISON ETAL 3,145,025

BOWLING BALL SPEED MEASURING AND INDICATING DEVICE

Filed Sept. 18, 1961



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United States Patent Office 3,145,025 Patented Aug. 18, 1964

3,145,025

BOWLING BALL SPEED MEASURING AND INDICATING DEVICE

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Filed Sept. 18, 1961, Ser. No. 138,635
4 Claims. (Cl. 273—54)

The present invention relates to amusement devices and in particular relates to an improved bowling lane having a ball speed timing device for further perfecting a person's bowling skill.

As is well known in tenpin bowling, in order to attain a marked degree of skill and the resulting high scoring average which is viewed with esteem in bowling circles, a bowler must be consistent in the manner in which he delivers the ball to the lane in order to consistently hit the "strike pocket" of the pins. Almost all accomplished bowlers employ a "hook" ball which curves as a result of a lateral spinning of the ball. The curving ball is generally accepted as superior to a ball which rolls straight because of the angle at which the curving hook ball impacts the pins. When a hook ball is employed, it is essential to develop consistency with respect to the amount of spin put on the ball as it is released from the hand and also with respect to the speed at which the ball is rolled down the lane. It is well known that, given the same amount of spin, a slower ball will curve considerably more than a faster ball. Therefore, if an individual bowler throws, on successive rolls, a ball of inconsistent speed, in all probability the ball will curve more one time than the next so that, even if the ball is initially directed at the same spot each time, the ball will not curve to the strike pocket of the pins with the high degree of accuracy and regularity required for high scores. Also, as a practical matter, if the speed at which the ball travels down the lane is varying from one roll to the next, it is an indication that the bowler's approach and delivery form is also inconsistant in that a greater or lesser amount of energy is being exerted, or perhaps a faster or slower approach to the foul line is being taken. All of these factors in the approach and delivery of the ball directly or indirectly affect the amount of hook spin put on the ball at release and, therefore, the lateral distance the ball will hook as it travels down the lane.

Therefore, it is contemplated by the present invention to provide in combination with a bowling lane, a device for determining the elapsed time required for the bowling ball to travel the length of the bowling lane and to visually present the elapsed time to the bowler whereby the bowler can readily ascertain the speed at which he is rolling the ball and can thereby develop the consistency necessary for a high degree of skill and resulting high scoring average.

Therefore, it is an important object of the present invention to provide a means for improving one's bowling skill by developing consistency in the manner and speed at which the ball is delivered.

It is a further object of the present invention to provide a bowling ball timing device which effectively employs an economic combination of relatively inexpensive components which are readily available on the present market.

Still another object of the present invention is to provide a device of the type described which utilizes the standard frequency of the community power source as the reference timing means.

Another object of the present invention is to provide a device of the type described which visually indicates the time required for a bowling ball to travel the length of the lane and to maintain this visual indication until the next ball is rolled at which time the timing device will automatically reset and start the timing sequence for the next ball that is rolled.

Additional objects and advantages will be evident from the following detailed description and drawing wherein:

The single drawing is a schematic representation of a combination of components in accordance with the present invention.

Referring now to the drawing, a standard bowling lane is indicated generally by the reference numeral **10** and has the usual foul line **12** at what is herein termed the first end thereof with an approach or delivery run **14** shown partially broken away. The lane also has gutters **13** and **15** with gutter side wall structure **13***a* and **15***a*, respectively. The conventional triangular arrangement of tenpins indicated generally by the reference numeral **16** is located on what is hereafter termed the second end of the lane **10**.

A first trigger means **18** is provided adjacent the first end of the lane **10** and is preferably spaced down the lane from the foul line **12** a distance as hereafter described. A second trigger means **20** is located adjacent the second end of the lane **10** preferably just in front of the No. 1 pin of the group of tenpins **16**. The trigger means **18** and **20** may be of identical construction and each preferably comprises some suitable photoelectric device which produces an electrical signal as a result of a bowling ball passing the respective trigger means as it travels down the lane **10**. The trigger means are preferably comprised of light sources **18***a* and **20***a*, respectively, which project beams of light **18***b* and **20***b*, respectively, transversely across the lane to illuminate light-dependent resistors **18***c* and **20***c*, respectively. The light-dependent resistors are semiconductor devices of the well-known commercially available type which have a very high resistance when not illuminated and a very low resistance when illuminated by a light source. The light beams **18***b* and **20***b* are preferably located at a height above the surface of the lane **10** such as to be interrupted by the passage of a bowling ball rolled down the lane and preferably are disposed only an inch or two from the surface so that the light sources **18***a* and **20***a* and light-dependent resistors **18***c* and **20***c* may be wholly contained within the side walls **13***a* and **15***a* of the gutters **13** and **15**. The arrangement of the light beams **18***b* and **20***b* close to the surface also results in a smaller area of the ball interrupting the light beam for a shorter period of time to increase the accuracy of the timing device hereafter described.

The output from the light-dependent resistor **18***c* of the first trigger means **18** is connected to a start-stop relay circuit **22** in a manner to start the timing device operating as hereafter described. The output from the light-dependent resistor **20***c* of the second trigger means **20** is connected to the start-stop circuitry **22** to stop operation of the timing device. The 60 cycles per second power source **24** which is the standard frequency for all community power sources in this country, is passed through a frequency doubler **26** which increases the frequency to 120 cycles per second. The output from the frequency doubler **26** is controlled by the start-stop circuitry **22** which either connects or disconnects the A.C. signal to a cycle or impulse counter and visual indication device **28**, as hereafter described.

The cycle or impulse counter and indicator **28** is preferably of the type which is well-known in the art as the Burroughs 1000 BeamX Switch used in combination with a Burroughs Digital Readout Nixy Tube. Both the BeamX switch and the Digital Readout tube are readily available on a quantity basis on the present market at a relatively modest cost. The BeamX switch is characterized by its capacity for digitally counting the cycles or pulses of an alternating current by means of a stored charge on a digital series of minute plates. The BeamX switch is further characterized by its capacity to retain the

charge on the switch at the end of the counting sequence to provide a memory function until the charges stored as a result of counting the pulses are drained from the switch, which can be done substantially instantaneously. The Digital Readout Nixy Tube is comprised of a plurality of wire filament numbers superimposed one over the other each of which is connected by separate circuitry to the various switch segments of the 1000 BeamX digital switch in such a manner that, as each impulse being counted charges the switch, the successive corresponding numbers of the Digital Readout tube are illuminated. When the last impulse has been applied to the BeamX switch, the switch maintains the last total charge so that the last number illuminated on the Readout tube remains illuminated indefinitely until the BeamX switch is reset by draining the charges therefrom. A reset circuitry **30** is provided for automatically draining the charge responsive to a signal from the first trigger means **18** and resetting the BeamX switch to zero.

In operation, a bowler delivers a ball from the approach area **14** across the foul line **12** and directed along the lane **10** toward the tenpins **16**. As the ball interrupts the light beam **18***b*, an electrical signal is sent from the light-dependent resistor circuit **18***c* to the stop-start circuitry **22**. In response to the signal, the start-stop circuitry **22** then connects the 120 cycles per second power source derived from the standard 60 cycle community source by the doubler **26** to the cycle or impulse counter **28** and simultaneously drains any charge from the counter by triggering the reset circuit **30** to reset the switch to zero. The impulse counter **28** then commences to count the 120 cycles per second until the bowling ball travels the length of the lane and interrupts the light beam **20***b* of the second trigger means **20**. An electrical signal is then produced in the light-dependent resistor **20***c* and is fed to the start-stop circuitry **22** to disconnect the 120 cycles per second power source from the cycle or impulse counter **28**. Due to its ability to store or remember the position of the last number of impulses counted, the number displayed on the Digital Readout Nixy Tube of the counter and indicator device **28** will correspond to the number of pulses or cycles counted during the time required for the ball to travel from the first trigger means to the second trigger means. Since 120 pulses are being counted per second the number appearing on the readout means will not be an expression of the time in seconds, to the nearest one hundredth of a second, required for the ball to travel between the first and second trigger means unless a correction factor is introduced to the system.

While the correction factor could be introduced by some complicated means, the correction to provide a readout to the nearest one hundredth of a second is easily accomplished by placing the first trigger means **18** at a point spaced down the lane from the foul line a distance approximately one-sixth the length of the lane from the foul line to the No. 1 pin. In other words, the distance between the first and second trigger means **18** and **20** should be five-sixths the length of the lane between the foul line and the tenpins, which it will be appreciated is equal to the length of the bowling lane multiplied by the reciprocal of the smallest increment of time to be measured and divided by the frequency of the power source. While this procedure is not acceptable for extremely accurate speed measurements, it is more than sufficiently accurate for the purposes set out and provides a very economical means for converting the reading on the readout tube to seconds. This arrangement also insures that the bowling ball will be rolling on the surface of the lane **10** as it passes the first trigger means since it is not uncommon for the ball to be lofted in the air over the foul line for some distance before it begins to roll on the lane. Yet this system permits the light source **18***a* to be housed within the conventional side rails of the gutter construction. The resulting correction then produces, with considerable precision, the elapsed time required for the ball to travel from the foul line **12** to the pins **16**.

The reading on the Readout tube of the impulse counter and indicator **28** is maintained until the next ball is rolled and intercepts the light beam **18***b* which produces an electrical signal from the light-dependent resistor **18***c*, as previously described. This electrical signal triggers the reset circuit **30** which instantaneously drains the charge from the counter **28** to reset the counter to zero and simultaneously connects the 120 cycle power source to the counter **28**. The counter **28** then commences to count the cycles until the ball travels the length of the lane and intercepts the light beam **20***b* at which time the 120 cycle signal is disconnected from the counter in the manner previously described. Of course, it will be appreciated that, if desired, the reset circuit **30** can be manually operated to reset the counter-readout means **28** to zero.

From the above detailed description of a preferred embodiment of our invention, it will be evident that an improved bowling lane has been described which will permit a person to scientifically monitor the speed at which he is rolling the ball and thereby assist him to develop a consistent delivery of the ball. It will also be evident that the device will create considerable interest in the sport of bowling in that it will present a novel and unique scientific standard by which the novice or amateur can compare his ability with the more accomplished or professional bowler.

While a particular embodiment of our invention has been described in detail, it is to be understood that various changes and substitutions in the combination above set out can be made without departing from the spirit and scope of our invention as defined by the appended claims.

We claim:

1. A device for improving a person's bowling skill comprising, in combination a bowling lane having a first end from which a ball is delivered by a bowler toward a second end, a plurality of pins upon the second end to be struck down by the ball, a first trigger means adjacent the first end of the lane and a second trigger means adjacent the second end of the lane, the first and second trigger means each having a photobeam projected across the lane and positioned a distance from the surface thereof as to be interrupted by the passage of a ball along the lane, each of the trigger means producing an electrical signal when the photobeam is interrupted by the passage of a ball, a frequency stable alternating current power source, counting means for counting the cycles of the alternating current power source, switching circuit means responsive to the signal from the first trigger means for connecting the power source to the counting means whereby the counter will commence to count the cycles of the power source, switching circuit means responsive to the signal from the second trigger means for disconnecting the power source from the counting means, and visual indicator means connected to the counter means for indicating the number of pulses counted by the counter means which will be a measure of time required for the ball to traverse the distance between the first and second trigger means.

2. A device for improving a person's bowling skill comprising, in combination, a bowling lane having a first end from which a ball is delivered by a bowler toward a second end, a plurality of pins upon the second end to be struck down by the ball, a first trigger means adjacent the first end of the lane and a second trigger means adjacent the second end of the lane, the first and second trigger means each having a photobeam projected across the lane and positioned a distance from the surface thereof as to be interrupted by the passage of a ball along the lane and producing an electrical signal when the respective photobeam is interrupted by passage of a ball, the distance between the first and second trigger means being approximately five-sixths the length of the bowling lane, a stable one hundred and twenty cycle alternating power source, counting means for counting the cycles of the alternating current power source, switching circuit means responsive to the signal from the first trigger means for connecting the power source to the counting means whereby the counter will commence to count the cycles of the power

source, switching circuit means responsive to the signal from the second trigger means for disconnecting the power source from the counting means, and visual indicator means connected to the counter for indicating the number of pulses counted by the counter means which will be a measure of the time required for the ball to traverse the length of a bowling lane expressed in one-hundredths of a second.

3. A device for improving a person's bowling skill by measuring the time required for the ball to traverse the bowling lane comprising, in combination, a bowling lane having a first end from which a ball is delivered by a bowler toward a second end, a plurality of pins upon the second end to be struck down by the ball, a first trigger means adjacent the first end of the lane and a second trigger means adjacent the second end of the lane, the first and second trigger means being sensitive to the passing of the ball along the lane to produce an electrical signal, a frequency stable alternating current power source having a frequency greater than the smallest increment of time which it is desired to measure, counting means for counting the cycles of the power source, switching circuit means responsive to the signal from the first trigger means for connecting the power source to the counting means whereby the counter will commence to count the cycles of the power source, switching circuit means responsive to the signal from the second trigger means for disconnecting the power source from the counting means, the distance between the first and second trigger means being approximately equal to the length of the bowling lane multiplied by the reciprocal of the smallest increment of time which it is desired to measure and divided by the frequency of the power source, and visual indicator means connected to the counter of indicating the number of pulses counted by the counter means which will be a measure of the time to the smallest increment desired required for the ball to traverse the length of the bowling lane.

4. A device for improving a person's bowling skill comprising, in combination, a bowling lane having a first end from which a ball is delivered by a bowler toward a second end, a plurality of pins upon the second end to be struck down by the ball, a first trigger means adjacent the first end of the lane, and a second trigger means adjacent the second end of the lane, the first and second trigger means each having a photobeam projected across the lane and positioned a distance from the surface thereof to be interrupted by the passage of a ball along the lane, each of the trigger means producing an electrical signal when the photobeam is interrupted by the passage of a ball, timing means, a first switching circuit means responsive to the signal from said first trigger means for starting said timing means, a second switching circuit means responsive to the signal of said second trigger means for stopping the timing means, and visual indicator means connected to the timing means for visually displaying an elapsed time proportional to the time required for a ball to travel along the lane between the first and second photobeams as timed by said timing means.

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