May 18, 1965 I. ROTH 3,184,678

PISTOL CONTROLLED DEVICE FOR TIMING RACES INCLUDING A DIGITAL DELAY SYSTEM

Filed April 7, 1961 2 Sheets-Sheet 1

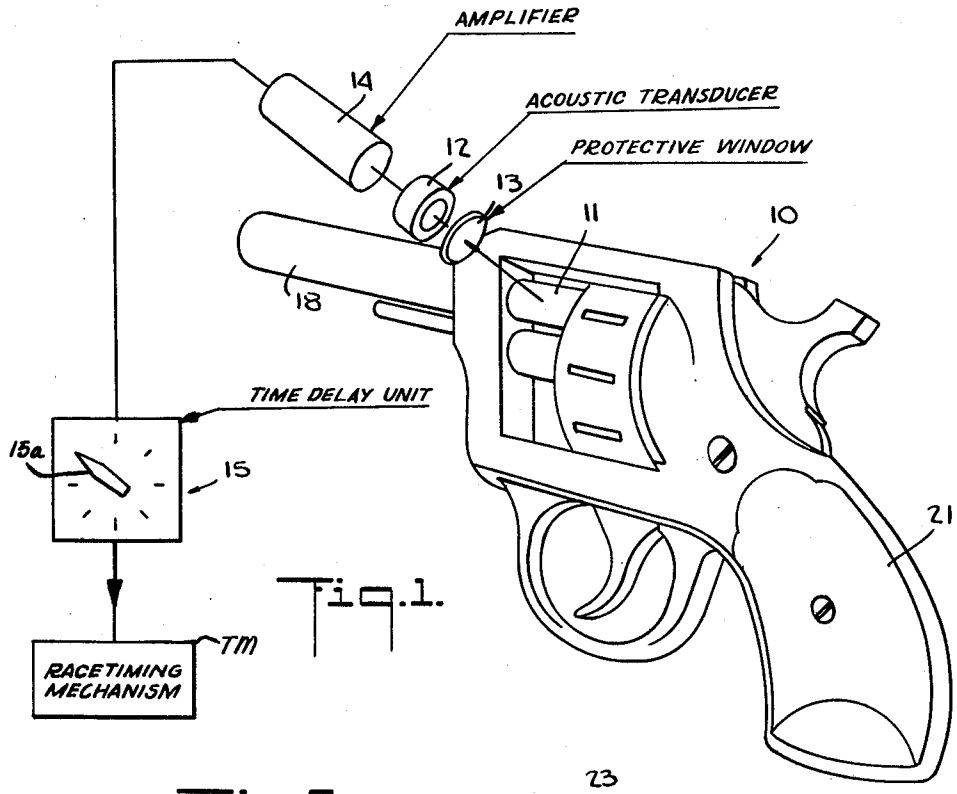
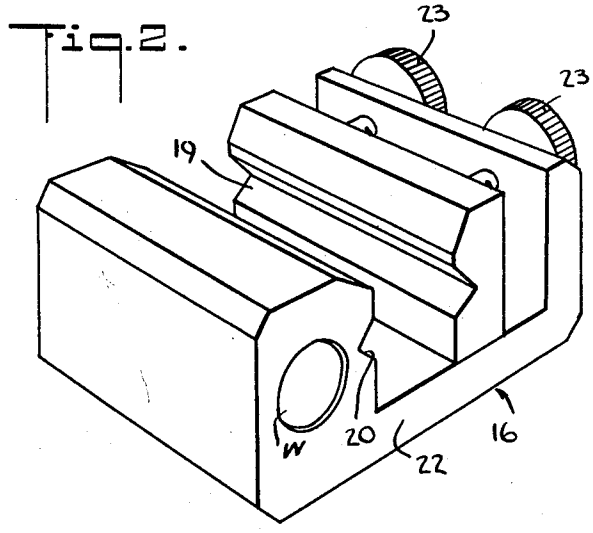


Fig. 1.

Fig. 2.



INVENTOR.
IRVING ROTH

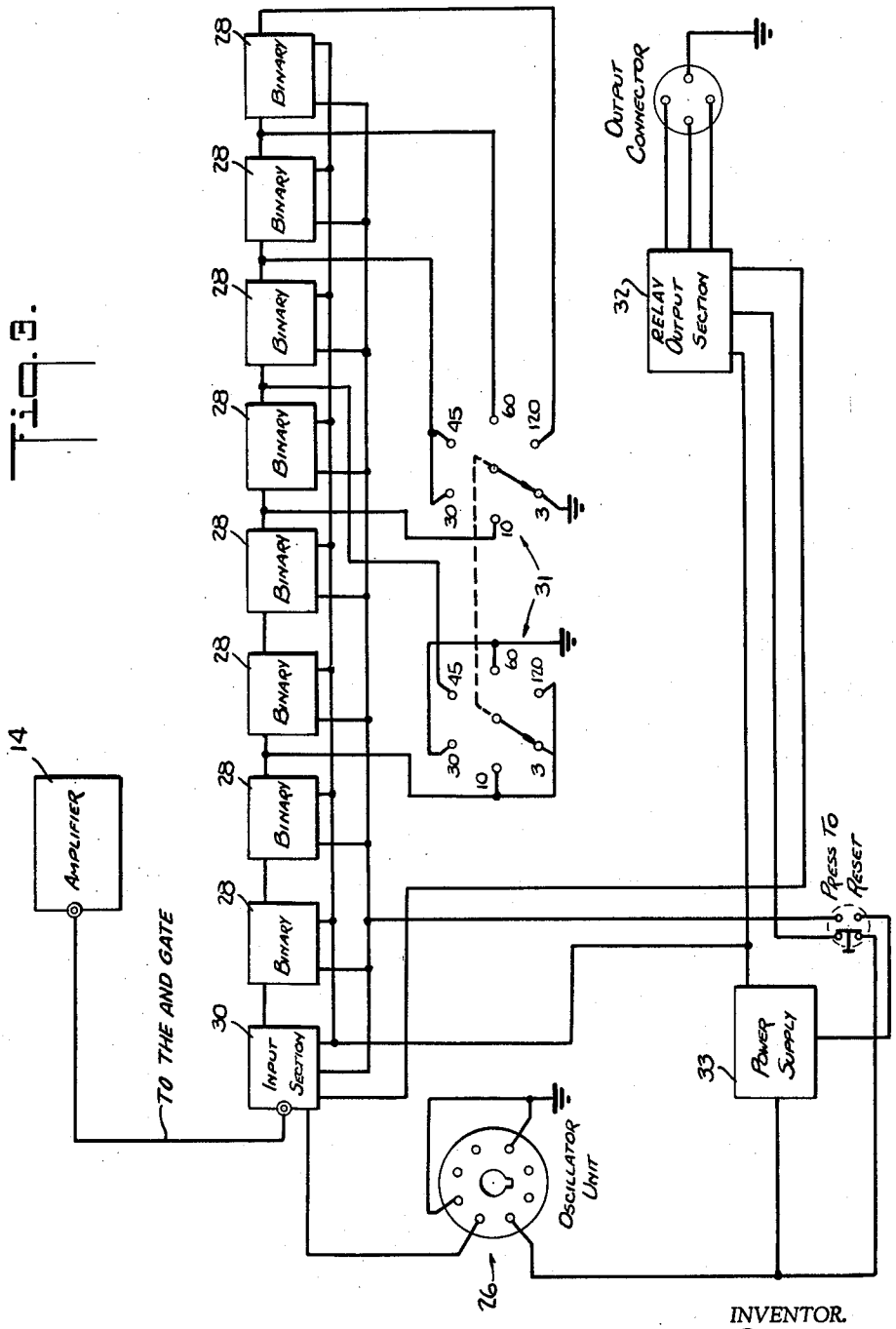
BY
Kenyon & Kenyon
ATTORNEYS

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Fig. 1.



INVENTOR.
IRVING ROTH

BY Kenyon & Kenyon
ATTORNEYS

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3,184,678

PISTOL CONTROLLED DEVICE FOR TIMING RACES INCLUDING A DIGITAL DELAY SYSTEM

Irving Roth, Williston Park, N.Y., assignor to Bulova Research and Development Laboratories, Inc., Woodside, N.Y., a corporation of New York

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1 Claim. (Cl. 324—68)

The present invention relates generally to timing devices and more particularly to a device suitable in foot races for synchronizing the timing mechanism with the starter's pistol shot.

Typically in foot races a starter shoots a blank pistol as a signal to start the race. A clock or camera or other recording device must be synchronized with the pistol shot so as to start recording simultaneously with the start of the race. One technique that has been used for this purpose is to set up a microphone at the starting line which gives an output signal to start the timing device when the explosive acoustic signal reaches the microphone. A significant drawback to this technique is the false starts which are caused by ambient noise.

Another technique is to use a special starter's pistol internally equipped with an electrical switch driven by the trigger through mechanical linkages. A drawback to the mechanical linkage technique is the possibility of error in time coincidence between the gun blast and switch closure. Even were the linkage to introduce no error, there is a time delay between the blast going off and the instant the runners hear the blast.

Accordingly it is the main object of this invention to provide a device for accurately synchronizing the recording or timing mechanism used to time a race with the starting gun blast.

It is another object of the invention to provide a device of the above-described type which is adapted to operate in conjunction with any existing starting gun.

It is a further object of the invention to provide a device which is responsive to the starting gun blast and which operates in conjunction with a timing delay adjustment so that an electrical control signal for actuating the timing mechanism will occur at the time the sound of the pistol shot reaches the runners.

Briefly stated, these objects are attained by an acoustic or light sensing cell mounted on or near the gun. The cell produces an electric signal in response to the gun blast. The cell signal is amplified to produce a control signal suitable for triggering a clock, camera or other recording or timing device. The control signal is then transmitted to the recording device through a manually adjustable time delay which is set to make the arrival of the signal at the recording device coincide with the arrival of the sound from the gun blast at the starting line.

Further objects and a fuller understanding of the invention may be had by referring to the following description and claim taken in conjunction with the accompanying drawings in which:

FIG. 1 is a block schematic of the invention.

FIG. 2 is a perspective embodiment of the invention.

FIG. 3 is a block schematic of the time delay unit.

Referring now to FIG. 1, the gun **10** is shot to produce a blast which is concentrated in blast area **11**. An acoustic transducer **12** is mounted near the blast area **11** and produces an electric signal in response to the blast. It is preferable, and frequently necessary, to mount a protective window **13** across the face of the transducer **12** that receives the blast from the gun **10**. The signal output of the transducer **12** is fed into an amplifier **14** to be magnified into an output signal adequate to trigger whatever timing mechanism is used.

The timing in foot races is generally kept to a tenth of a second precision. For 60 and 100 yard dashes, where the records are under 10 seconds, the need for such precision is manifest. However, it is typical that tenth of a second precision is kept for all races, including those over a mile. Since the speed of sound in air is about 108 feet per tenth of a second, the position of the starter can affect the accuracy of the timing if the blast triggers the timing mechanism and thus starts the "clock" going before the sound of the blast reaches the runners at the starting line. To avoid such inaccuracy, the output of the amplifier **14** is fed through a time delay unit **15** before being applied to the timing mechanism TM. Delay unit **15** is preferably an adjustable delay unit with a dial **15***a* calibrated in feet so that the output of amplifier **14** can be delayed by an amount equal to the time it takes the blast to reach the starting line from wherever the starting pistol **10** is located.

FIG. 2 illustrates a specific embodiment of the invention employing a photo-electric transducer, such as an infra-red sensitive cell, instead of an acoustic transducer. This embodiment assures that the infra-red cell will face the proper area **11** on the pistol **10** to receive infra-red radiations. The protective window W is shown in a vise-like structure **16**. Directly behind the window, and therefore not shown, is the infra-red cell and behind that is the amplifier (not shown). The barrel **18** of the starter's pistol is placed in between the two notched walls **19**, **20** with the handle **21** of the starter's pistol **10** on the protective window W side **22** of the clamp **16**. Thumbscrews **23** are then turned to move wall **19** toward wall **20** and thus securely clamp the pistol barrel **18**. The pistol **10** must be clamped with its handle **21** on the protective window W side of the clamp so that the window W will be in view of the flash area **11** of the gun **10**.

The vise-like structure **16** is carried on the gun barrel **18** and so should be made of a light material in order to avoid hampering the starter in his use of the gun **10**. The vise-like structure **16** is shown as removable from the gun **10** as such would be preferable in most applications. However, such structure can be permanently built onto a pistol that is used exclusively for races to produce a less unwieldy unit.

FIGURE 3 indicates how the time delay is accomplished in a preferred version of the invention. An oscillator **26** continuously runs, but the binary counters **28** cannot count the oscillator output cycles until a signal from the amplifier **14** is received by an "and" gate in the input section **30**. The switch **31** selects the number of counts and the signal proceeds to the output section **32** after delay through the number of binary counters **28** that are selected by the switch **31**. The dial **16** is directly connected to the switch **31** and rotation of dial **16** rotates switch **31**. The output section **32** contains an electromechanical relay which closes on receipt of the output signal from the binary counters **28**, thus transmitting an output signal to actuate and start the race timing mechanism used. The delay precision is limited only by the oscillator **26** frequency. The power supply **33** is of standard design and supplies power for all sections of the delay circuit **15**.

The amplifier **14** and sections of delay circuit **15** are shown in block form since their design would be familiar to one skilled in the art pertinent to such design. However, high precision is desired in the delay unit and for that reason a sequence of binary units as the main constituent of the delay circuit has been found preferable. The transducer **12** may require a bias for proper operation and in that case, the bias supply in the amplifier **14** can be used as transducer **12** bias. The amplifier **14** is preferably a self-contained unit having its own battery supplied power.

Although the invention has been described with a certain degree of particularity it is to be understood that the present disclosure is by way of example and that changes in the details of construction and operation will be apparent to one skilled in the art and can be made without departing from the scope and claims of the invention.

The crux of the invention is the coupling of a light, sound or heat sensing device with a starting pistol in such a fashion that the sensing device will respond to the pistol shot and produce a signal which can be used to start the race timing mechanism. Within this inventive concept numerous embodiments may be made. For example, an acoustic transducer and an infra-red transducer embodiment have been shown, yet, any light, sound or heat transducer may be used that will respond to a pistol blast, and the selection of one or the other is a matter of choice. Certainly, the clamp arrangement shown in FIG. 2 is but one way of assuring the proper spatial alignment of the blast area with the transducer. Even the use of a time delay device is optional and depends upon the degree of accuracy desired.

It is intended, therefore, to cover all such modifications as fall within the true scope of the invention.

What is claimed is:

A race timing apparatus comprising a pistol removed a predetermined distance from a starting line sufficient to introduce a delay in the order of a tenth of a second between the pistol shot and the time the sound thereof reaches the starting line, a transducer mounted on said pistol and responsive to a shot therefrom to produce a control signal, a race timing mechanism, and a time delay device intercoupling said transducer to said mechanism to initiate the operation thereof at the same instant the sound of the shot traverses said distance and reaches the starting line removed from the pistol, said time delay device including an oscillator having a given frequency, a counter coupled to said oscillator to count the cycles thereof and to provide an output signal when a predetermined count is reached at said same instant to initiate the operation of said mechanism, and means responsive to said output signal to initiate the operation of said race-timing mechanism.

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WALTER L. CARLSON, *Primary Examiner.*

SAMUEL BERNSTEIN, FREDERICK M. STRADER, *Examiners.*