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(54) Stop watch and clocking system

(57) The stop watch comprises a magnetic sensor (2) for sensing magnetism and generating a signal upon detecting a predetermined amount of magnetism, a clocking section (1) for controlling the start and end of clocking each time the signal is received and storing a measured time, and a display section (3) for displaying the time stored in the clocking section (1). The magnetic sensor (2) is installed in an automobile and connected to the clocking section (1) via a cable, and the clocking section (1) and the display section (3) are formed integrally. Magnetic members (50, 51, 52) are installed in a course (40) on which the automobile (41, 42) travels.

FIG. 1

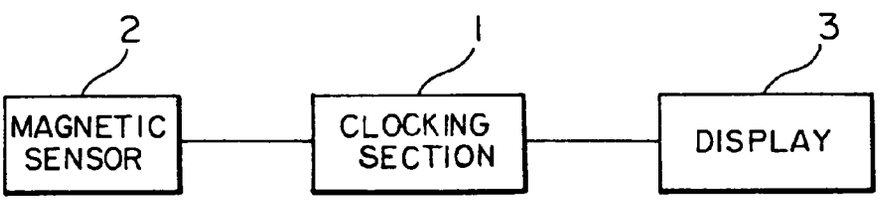
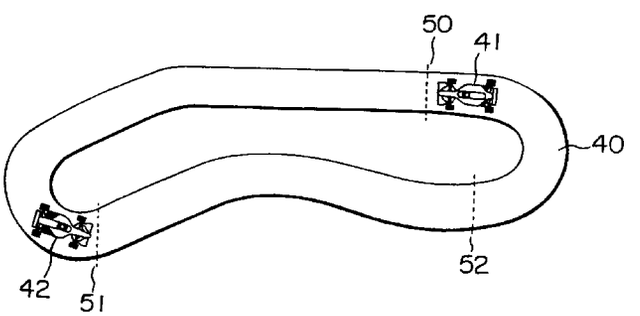


FIG. 4



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a stop watch and a clocking system, and in particular, to a stop watch installed in an automobile for measuring a circuit lap time for each automobile and a clocking system employing this stop watch.

2. Description of the Related Art

One example of conventional systems for measuring the circuit lap time of an automobile is shown in FIG. 6. The system comprise a sensor 71 installed in a circuit 60 for sensing the passage of an automobile 61 or 62 when it interrupts the light transmitted between a pair of a transmitter and a receiver, and a control section 72 for receiving a signal from the sensor 71 through a cable or radio to measure and display the time. The control section 72 starts clocking in response to a start signal from the sensor 71 or a human operator, and measures and displays a lap time each time the automobile 61 or 62 passes the sensor 71.

In addition, if the time is measured for each automobile without using the system in FIG. 6, a human operator other than the driver uses a manual stop watch to measure the lap time at the start/goal point.

Furthermore, the need to accurately measure the time at ski meets has led to the proposition of various methods; Japanese Utility Model Application Laying Open (KOKAI) No. 5-94794 (Japanese Utility Model Application No. 4-43444) discloses a stop watch comprising a switch that opens and closes upon detecting a specified amount or more of magnetism; a clocking section that changes its operation mode in response to the operation of the switch by stopping clocking upon a next operation of the switch during clocking, resetting the time to retain the reset value upon a subsequent operation of the switch while the measured time is retained after clocking has ended, and starting clocking upon a subsequent operation of the switch while the value is maintained at zero; and a display section for displaying the time measured by the clocking section, as well as a clocking method using this stop watch wherein a magnet sensed by the switch is located at the start and goal point.

The conventional clocking system shown in FIG. 6 requires that the sensor and the control section be connected together via a cable or communicate with each other by radio, and the installation of such a cable or a radio transmitter and receiver requires costs and time. To inform a driver in an automobile of a measured time, the automobile must be stopped or another communication system must be used. Furthermore, to measure the lap times of a plurality of automobiles and the block travel time that is the time required by an automobile to pass through part of a course, the control section requires complicated operations, resulting in the need of a special operator.

In addition, if the time is measured by a human operator other than the driver using a manual stop watch, it is difficult to measure both the lap time and the block travel time, and the accuracy of measured time is insufficient due to the manual measurement.

Furthermore, with the stop watch and the system using this stop watch which have been disclosed in Japanese Utility Model Application Laying Open (KOKAI) No. 5-94794 (Japanese Utility Model Application No. 4-43444), the driver can measure the lap time alone, but cannot measure a plurality of continuous lap times or the block travel time. In addition, the ability to follow up the passage of an automobile traveling at a very high speed is not reliable in terms of the operational speed of the switch.

SUMMARY OF THE INVENTION

It is therefore the object of the present invention to provide a stop watch and a clocking system that enable the driver to measure a plurality of continuous lap times and the block travel time.

It is another object of the present invention to provide a stop watch and a clocking system having the ability to follow up the passage of an automobile traveling at a very high speed.

It is still another object of the present invention to provide a stop watch and a clocking system having the ability to measure both the lap time and the block travel time accurately.

These and other objects of the present invention is achieved by a stop watch comprising a magnetic sensor for generating a signal upon sensing a predetermined amount of magnetism, a clocking section for receiving said signal and controlling the start and end of clocking in response to said signal, a storage section for storing a measured time, and a display section for displaying the stored time. The magnetic sensor generates a signal upon detecting a predetermined amount of magnetism, the clocking section controls the start and end of clocking in response to the reception of the signal, and the storage section stores the measured time, thereby enabling the driver to measure a plurality of continuous lap times and the block travel time.

Preferably, the magnetic sensor comprises a Hall element. A specified amount or more of magnetism is sensed accurately by the Hall element, even if an automobile with the magnetic sensor mounted thereon travels at a very high speed.

In accordance with the present invention, a clocking system includes a stop watch installed in an automobile which comprises a magnetic sensor for generating a signal upon sensing a predetermined amount of magnetism, a clocking section for receiving said signal and controlling the start and end of clocking in response to said signal, a storage section for storing a measured time, and a display section for displaying the stored time,

and a magnetic member installed in a course on which the automobile travels. The magnetic sensor installed in an automobile generates a signal upon detecting a predetermined amount of magnetism, the clocking section controls the start and end of clocking in response to the reception of the signal, and the storage section stores the measured time, thereby enabling the driver to measure a plurality of continuous lap times and the block travel times.

Preferably, the magnetic sensor comprises a Hall element, thereby enabling a specified amount or more of magnetism to be sensed accurately, even if an automobile with the magnetic sensor mounted thereon travels at a very high speed.

In accordance with the invention, the magnetic member may be a magnetic bar comprising a magnet, thereby enabling the provision of various positions in which the magnetic sensor can be installed and various methods for installing the magnetic member.

The magnetic bars may be installed in a plurality of positions in the course, thereby enabling block travel times and lap times to be measured using the stop watch.

Further object and advantages of the present invention will be apparent from the following description of the preferred embodiments of the invention as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing the configuration of a stop watch according to this invention;

FIG. 2A is a top view of the magnetic sensor in FIG. 1;

FIG. 2B is a cross-sectional view of the magnetic sensor in FIG. 1;

FIG. 3 is a plane view showing an embodiment of both the clocking section and the display section in FIG. 1;

FIG. 4 is an explanatory view showing an embodiment of the clocking system according to this invention;

FIGS. 5A to 5C are explanatory views showing embodiments of the magnetic bars in FIG. 4; and

FIG. 6 is an explanatory view showing a conventional clocking system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of a stop watch according to this invention is described below with reference to the drawings.

As shown in FIG. 1, the stop watch according to this invention comprises a magnetic sensor 2 for sensing magnetism and generating a specified signal upon detecting a specified amount or more of magnetism; a clocking section 1 having a means for receiving a signal generated by the magnetic sensor 2 and controlling the start and end of clocking each time the signal is received and a means for storing a measured time; and a display section for displaying the time stored in the clocking section 1. The magnetic sensor 2 and the clocking sensor 1 are connected together by a cable, and the clocking section 1 and the display section 3 are formed integrally.

The magnetic sensor 2 has an appearance shown in FIG. 2A, and is attached mechanically to the bottom surface of an automobile with screws or bolts and nuts. The magnetic sensor 2 has an antiseismic and perfectly waterproof structure so as to be mounted outside the body. A substrate 21 having thereon a Hall element 22 for sensing magnetism is fixed inside a case 20 with epoxy resin, as shown in FIG. 2B. A signal generated by the Hall element 22 is transmitted to the clocking section 1 through a cable 24. Although in this embodiment, the substrate 21 with the Hall element 22 mounted thereon is fixed to the bottom surface, the direction sensed by the sensor can be varied by changing the position and direction in which the substrate 21 is fixed.

The clocking section 1 and display section 3 comprises a liquid crystal display section 31 for displaying a time and the number of laps measured and stored, a power switch 32 for turning the power on and off, a start/stop switch 33 for alternatively enabling and disabling signals from the magnetic sensor, a memory call switch 34 for sequentially invoking measured times, and an indicator 35 that flashes for a specified period of time when receiving a signal from the magnetic sensor 2, as shown in FIG. 3. With this configuration, a maximum of 99 measured times can be stored.

The operation of this embodiment is described below with reference to the drawings. In this embodiment, it is assumed that a magnetism generating member is installed in one position (the start/goal point) in a course on which automobiles with the stop watch installed therein travel.

A power switch 32 is pressed to turn the power on, and a start/stop switch 33 is used to enable signals from the magnetic sensor 2. When the magnetic sensor 2 first detects magnetism, an indicator 35 flashes for a specified period of time, and clocking is started. When the magnetic sensor 2 detects magnetism for the second time, the indicator 35 again flashes for a specified period of time, the clocking section 1 measures and stores the time that has passed since the first sensing of magnetism, and the liquid crystal display section 31 displays the number of laps 1 and the time that has passed since the first sensing of magnetism, the time stored in the clocking section 1. When the magnetic sensor 2 senses magnetism for the third time, the indicator 35 again flashes for a specified period of time, the clocking section 1 measures and stores the time that has passed since the second sensing of magnetism, and the liquid crystal display section 31 displays the number of laps 2 and the time that has passed since the second sensing of magnetism, the time stored in the clocking section 1. In this manner, a desired number of lap times are sequentially measured and stored.

By pressing the start/stop switch 33 for a specified period of time, the clocking is stopped, and the total accumulated time measured until the preceding lap is displayed on the liquid crystal display section 31. Although the display section 3 displays the last lap time, the memory call switch 34 can then be pressed to sequentially display on the liquid crystal display section 31, all the measured lap times from the lap number 1 to the last lap together with the respective lap numbers. Furthermore, if the memory call switch 34 and the start/stop switch 33 are then pressed simultaneously for a specified period of time, all the lap times stored in the clocking section 1 are cleared. To measure the time again after all the lap times have been cleared, the above operation is repeated from power on. If the start/stop switch 33 is pressed again without clearing the stored lap times, clocking is restarted. To prevent wasteful power consumption, this embodiment is configured to automatically turn the power off if the device has not been operated for thirty minutes after clocking has been stopped.

An embodiment of a clocking system according to this invention is described below with reference to the drawings.

The clocking system according to this invention comprises magnetic bars 50 to 52 consisting of magnets and located in three positions in a circuit 40 as magnetic members. Automobiles 41 and 42 that travel within the circuit 40 each carry the stop watch described in the above embodiment of the stop watch according to this invention. The configuration and operation of the stop watch are the same as in the above embodiment, and the description is thus omitted.

If the magnetic sensor 2 shown in FIG. 2 is installed on the bottom surface of the automobile, the magnetic bars 50 to 52 are preferably buried under the asphalt-surfaced road in the circuit 40, as shown in FIG. 5A. If, however, the magnetic sensor 2 is installed in a different position, the magnetic bars 50 to 52 may be installed on a side of the course of the circuit 40, as shown in FIG. 5B, or gate-like magnetic bars may be used, as shown in FIG. 5C.

By operating the stop watch in the order described in the embodiment of the stop watch, the drivers in the automobiles 41 and 42 can measure and display the travel time for the block between the magnetic bars 50 and 51, the travel time for the block between the magnetic bars 51 and 52, and the travel time for the block between the magnetic bars 52 and 50. In this case, each lap time that is equal to the accumulated block travel times can be displayed by pressing and holding the start/stop switch 33 for a specified period of time for each lap.

The above two embodiments have been described in conjunction with the stop watch configuration wherein the magnetic sensor 2 and the clocking section 1 are connected together via a cable and wherein the clocking section 1 and the display section 3 are configured integrally, the clocking section 1 and the magnetic sensor 2 may be configured integrally, or all the components may be constructed separately. Furthermore, the separate components may have a radio transmitter and receiver so as to communicate with each other.

To inform not only the driver but also people in the pit of measured times, the clocking section and the display section may be configured separately to communicate with each other by radio, with the display section installed both inside and outside the car body. Compared to the connection with cables, the use of radio improves the reliability of connection due to the absence of disconnection, but requires the provision of a plurality of channels used respectively for different automobiles and the transmission of identification signals from a sender which is then selected by a receiver, in order to deal with a plurality of automobiles traveling on the course.

In addition, although this embodiment has been limited to automobiles and circuits, it is applicable to motorbikes or bicycles traveling on closed courses.

Many widely different embodiments of the present invention may be construct without departing from the spirit and scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except as defined in the appended claims.

Claims

1. A stop watch comprising a clocking means (1) for controlling a start and an end of clocking, a storage means for storing a time measured by said clocking means and a display means (3) for displaying stored time in said storage means,

   characterized in that said stop watch comprises a magnetic sensor (2) for generating a signal upon sensing a predetermined amount of magnetism, and said clocking means (1) receives said signal generated by said magnetic sensor (2) and controls said start and end of clocking in response to received signal.

2. A stop watch according to Claim 1, characterized in that said magnetic sensor (2) comprises a Hall element.

3. A stop watch according to Claim 1 or 2, characterized in that said magnetic sensor (2) is mounted on an automobile (41), and said predetermined amount of magnetism is generated by a magnetic means (50) installed in a closed circuit (40).

4. A stop watch according to any one of Claims 1 to 3, characterized in that said storage means and said display means (3) communicate each other through a radio communication.

5. A stop watch according to Claim 4, characterized in that a frequency of said radio communication is

selected from predetermined number of frequencies.

6. A clocking system for measuring a lap time of an automobile (41) in a course (40), comprising a stop watch installed in said automobile, said stop watch including a clocking means (1) for controlling a start and an end of clocking, a storage means for storing a time measured by said clocking means, and a display means (3) for displaying stored time in said storage means,

characterized in that said stop watch comprises a magnetic sensor (2) for generating a signal upon sensing a predetermined amount of magnetism, and said clocking means (1) receives said signal and controls said start and end of clocking in response to received signal,

and in that a magnetic member (50) is installed in said course (40) for generating said predetermined amount of magnetism.

7. A clocking system according to Claim 6, characterized in that said magnetic sensor (2) comprises a Hall element.

8. A clocking system according to Claim 6 or 7, characterized in that said magnetic member (50) is a magnetic bar comprising a magnet.

9. A clocking system according to Claim 6 or 7, characterized in that said magnetic member (50) includes a plurality of magnetic bars (50, 51, 52) each installed in a plurality of positions in said course (40), respectively so as to measure block travel times and lap times.

10. A clocking system according to any one of Claims 6 to 9, characterized in that said storage means and said display means (3) communicate each other through a radio communication.

11. A clocking system according to Claim 10, characterized in that a frequency of said radio communication is selected from predetermined number of frequencies.

12. A stop watch in which the beginning and end of clocking by a clocking means are controlled by control signals supplied by a magnetic detector, the stop watch having storage means and being operable in response to a said control signal terminating a measured time period to store the time measured by the clocking means since the preceding control signal into said storage means and to cause the clocking means to start measuring a new time period continuous with the previous one.

FIG. 1

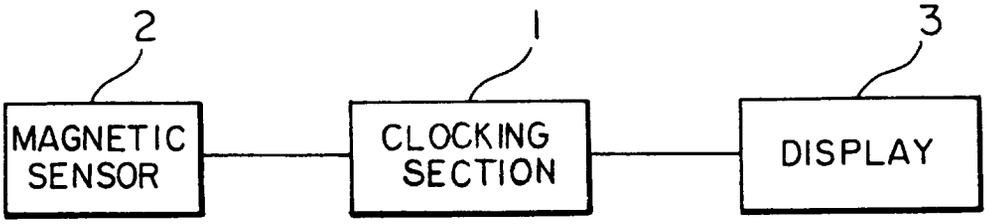

FIG. 2A

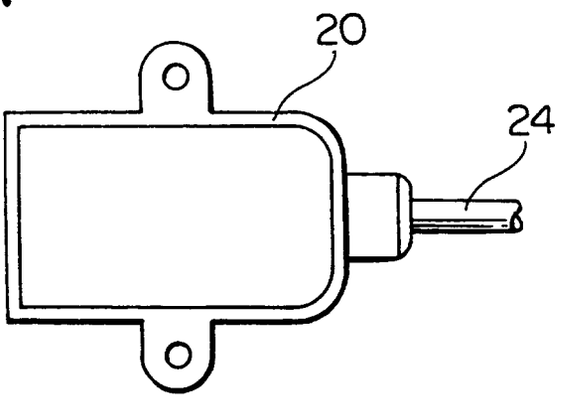

FIG. 2B

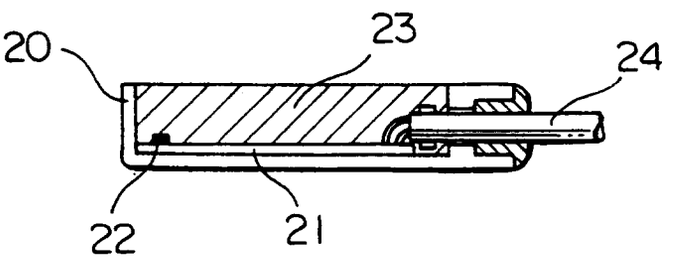

FIG. 3

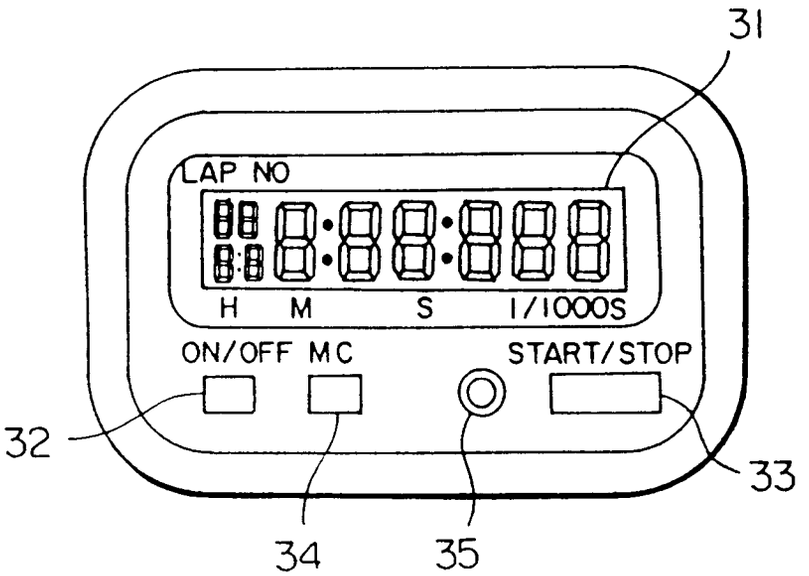
31
LAP NO
H M S 1/1000S
ON/OFF MC
START/STOP
32
33
34
35

FIG. 4

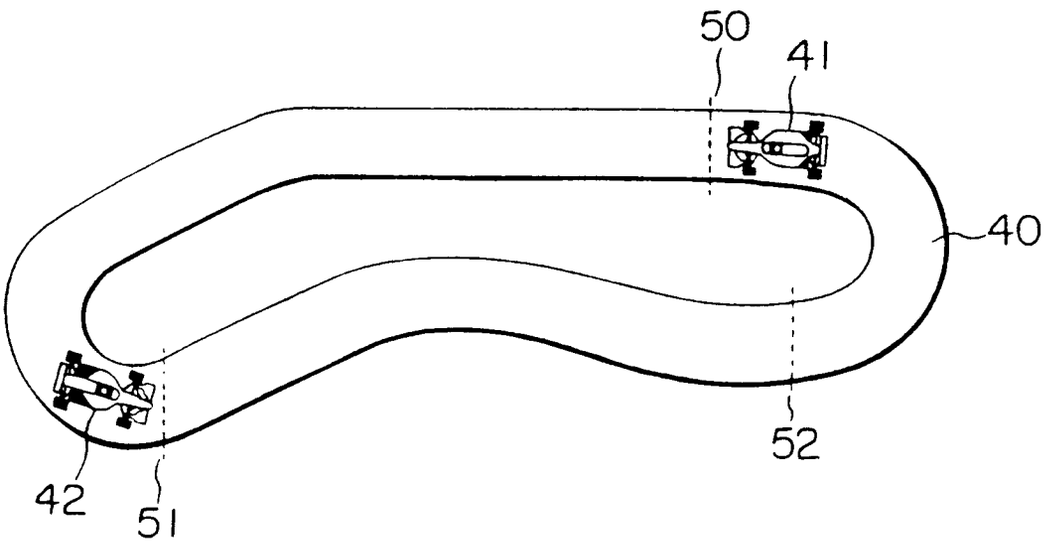
50
41
40
42
51
52

FIG. 5A

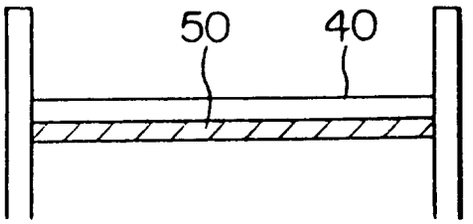

FIG. 5B

FIG. 5C

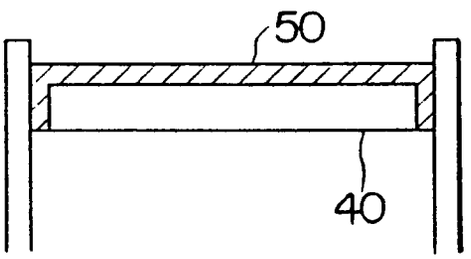
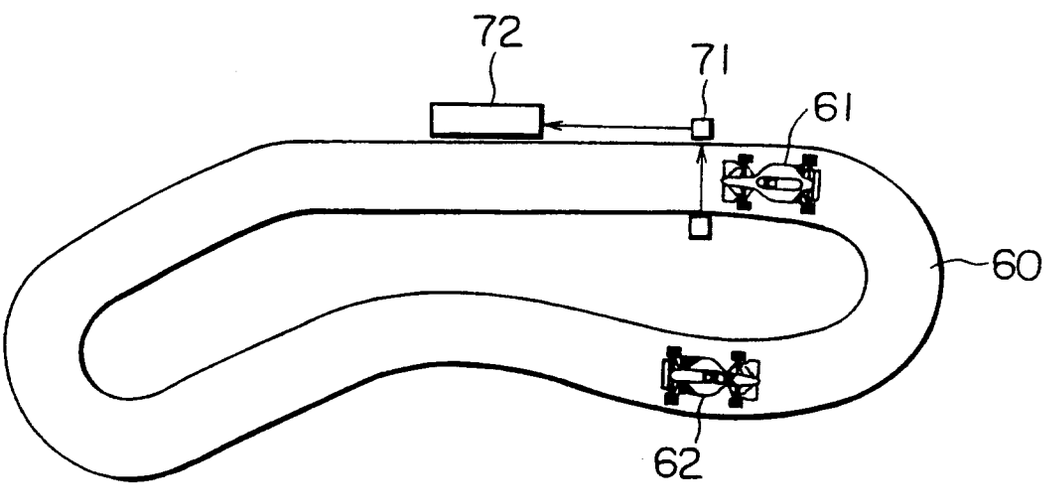
FIG. 6