United States Patent

Leu et al.

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[54] TIME MEASURING SYSTEM FOR SWIMMING COMPETITIONS

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **307/119**, 324/181, 340/323

[51] **Int. Cl.** **H01h 35/00**

[58] **Field of Search** ..... 340/272, 323; 200/86 R; 307/116, 119; 324/178, 180, 181

[56] **References Cited**

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[57] **ABSTRACT**

A time measuring system for swimming competitions, wherein a plate is attached to the wall of the swimming pool and electrical control signals for a time counter are produced when the plate is touched by a competitor. The control signals are produced by contact-free transducers such as piezo-electric, electromagnetic or electrodynamic transducers of high sensitivity and reliability.

9 Claims, 3 Drawing Figures

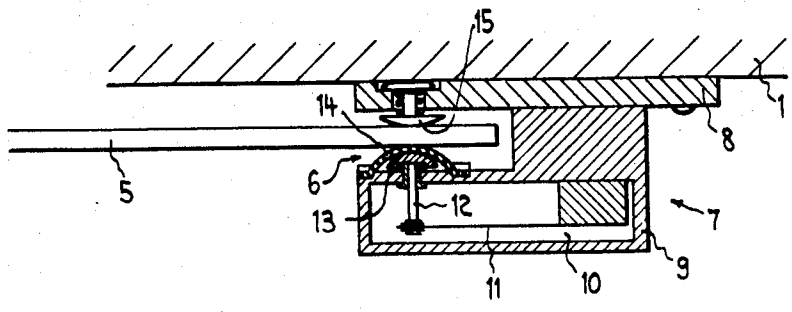


FIG. 1

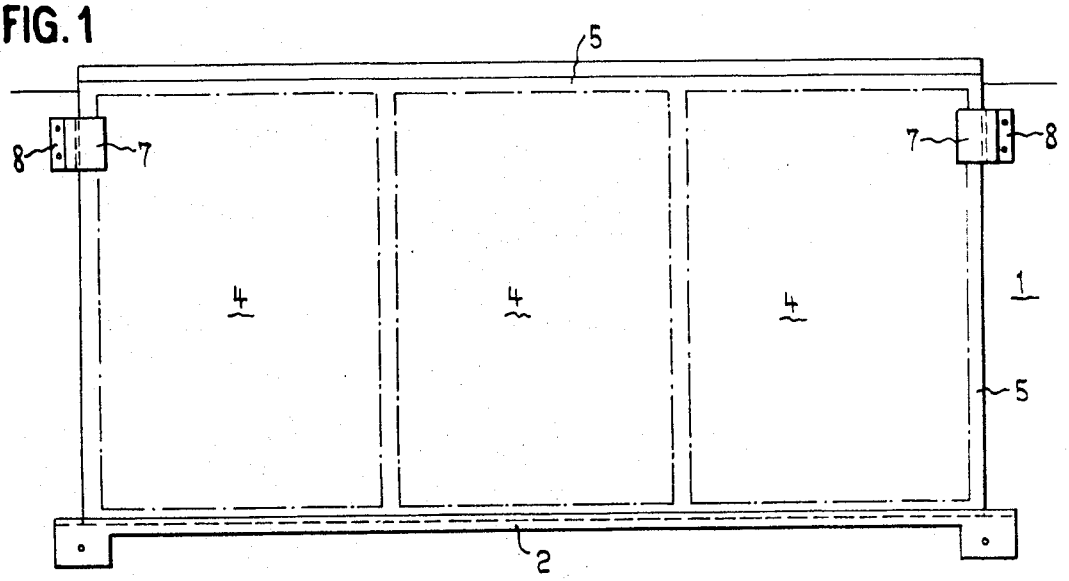


FIG. 3

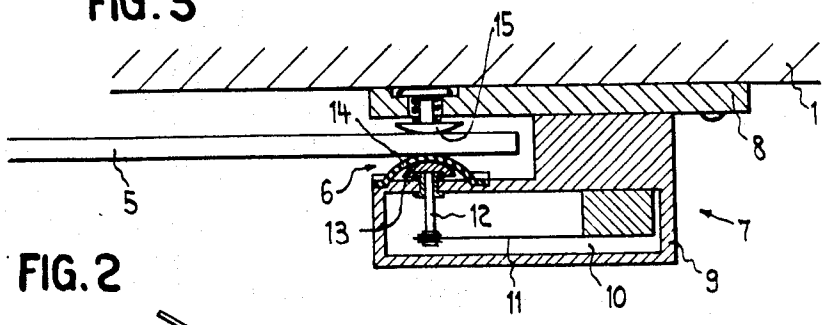
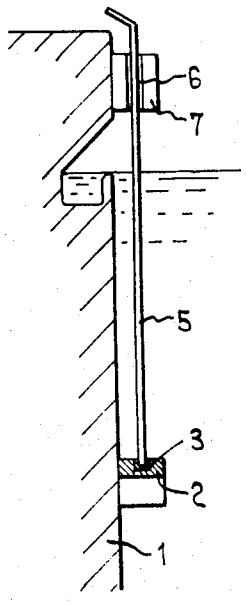


FIG. 2



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TIME MEASURING SYSTEM FOR SWIMMING COMPETITIONS

This invention relates to a time measuring system for swimming competitions, comprising a plate fixed at the wall of the swimming pool and means for producing an electric signal upon touching of said plate.

Prior systems of this kind include a plate or mat which may locally be deformed by pressure acting thereon, a system of elements responsive to local pressure being accommodated in or on this plate. These elements are either tubes wherein pressure pulses acting onto a pneumo-electric relay are produced when pressure acts against the plate, or such elements are pressure-responsive contact cables wherein conductors are urged against each other when local pressure is excerted onto the plate. A control circuit for a time counter is closed either by said pneumo-electric relay or by said contact cables and the time counter is stopped when a competitor touches the plate. All prior systems are relatively complicated and expensive and they require continuous maintenance. Pneumatic systems are also slow in operation.

It is an object of this invention to provide a simplier and more reliable system. This is achieved by providing a plate fixed at the wall of the swimming pool and means for producing an electric signal upon touching of said plate, a time counter adapted to be controlled by said signal, at least one contact-free electro-mechanical transducer operable by said plate for producing said electric signal upon touching of the plate. Preferably an active transducer producing itself the electrical signal, such as a piezo-electric transducer may be used. This invention is based on the idea not to make use of a local deformation of a plate or mat for acting onto pressure responsive elements, but to pic up the vibrations of relatively high frequency occuring in the plate or the displacement of the whole plate when the same is touched by a competitor. Therefore, instead of using a relatively rigid and hard plate preferably of metal is used. It may be an advantage to differentiate the signals produced by the transducer or transducers in order to emphasize the higher frequencies produced by impacts acting onto the plate over lower noise frequencies produced by waves in the swimming pool.

One embodiment of this invention will now be explained in detail and by way of example with reference to the accompanying drawing, wherein

FIG. 1 is a front view of the plate,

FIG. 2 is a vertical section through the plate and

FIG. 3 is a horizontal section through a lateral support for the plate.

A lower supporting rail 2 is fixed at the finishing wall 1 of a swimming pool. A metal plate 5 having a thickness of 1–2 mm is supported on the rail 2 by means of an insert 3 of elastical material such that the plate 5 may easily swing towards and away from the wall on which it is fixed. The plate is perforated on the areas 4 surrounded by dash-dotted lines. Near its upper end the plate 5 engages grooves 6 of two lateral supports 7 fixed to the finishing wall.

Each support 7 has a base plate 8 and a transducer casing 9. A piezo-electric transducer 11 is accommodated in the chamber 10 of casing 9. A transducer crystal of the bending type is used of which the one end is fixed on a block while the free end carries a feeler pin 12. The feeler 12 is guided in a sleeve and has a feeler head 13 at its outer end. An elastic membrane 14 connected to the transducer casing is spanned over the feeler head 13. The rim of plate 5 engaging groove 6 is maintained in touch with the membrane 14 by means of a spring-loaded head 15.

The output conductors of the transducer crystal are lead through a water-proof sealing of the transducer casing. The conductors are connected to a control circuit (not shown) responsive to signals of a level above a predetermined threshold for stopping a time counter in a manner well known per se. A differentiating circuit or high-pass filter may be connected into the canal transmitting the signals from the transducers to the control circuit in order to emphasize the components of higher frequency of the signals.

Due to the pressure excerted by the head 15 and by the waves in the basin onto the plate 5, the transducer 11 produces a base signal. The threshold of the control circuit is so adjusted that t is well above the level of said base signal so that the circuit cannot respond to the base signal. However, if a competitor touches the plate 5, substantial pressure changes are transmitted to the transducer 11. Usually the pressure will first diminue. This causes a sudden and marked change of the signal produced by the transducer whereby the control circuit is operated and stops the time counter.

The high simplicity of the device resides in the use of a simple metal plate without any measuring elements attached to the plate itself. The plate may be inserted into its supports and removed therefrom in an extremely simple manner. Trouble may only occur with the transducers which are above the water level and are thus always easily accessible for maintenance and repair.

Modified embodiments are feasible. As an example, other active transducers such as electromagnetic or electrodynamic transducers may be used. Passive transducers such as field plates (Hall elements) may be used. The transducers may be located in other places, and more than two transducers may be provided. However, a single properly located transducer may be sufficient in some cases.

What we claim is:

1. A time measuring system for swimming competitions, comprising a plate to be attached to a wall of a swimming pool, means for producing an electric signal upon touching of said plate, a time counter adapted to be controlled by said signal, at least one contact-free electromechanical transducer operable for producing said electric signal upon touching of the plate, said transducer having feeler means and said plate engaging without clearance between said feeler means and an elastic supporting portion.

2. A system according to claim 1, comprising at least one active transducer such as a piezo-electric, electromagnetic or electrodynamic transducer.

3. A time measuring system for swimming competitions, comprising a plate to be attached to a wall of a swimming pool, means for producing an electric signal upon touching of said plate, a time counter adapted to be controlled by said signal, at least one contact-free electro-mechanical transducer operable for producing said electric signal upon touching of the plate, wherein said plate is substantially stiff and is supported by a plurality of supports, said transducers being inserted between said plate and portions of said supports at the outer side of said plate opposite said wall of the swimming pool.

4. A system according to claim 3, wherein said plate is movably supported at its lower end and movably engages between lateral supports near its upper end, a transducer being provided on each support.

5. A time measuring system for swimming competitions, comprising a plate to be attached to a wall of a swimming pool, means for producing an electric signal upon touching of said plate, a time counter adapted to be controlled by said signal, at least one contact-free electromechanical transducer operable for producing said electric signal upon touching of the plate, said transducer having a feeler and said plate engaging without clearance between said feeler and an elastic supporting portion, wherein said elastic supporting portion is placed between said plate and the adjacent wall of the swimming pool.

6. A system according to claim 4, wherein said plate removably engages into slots of supports with its lower edge and its side edges.

7. A system according to claim 1, wherein said transducer is accommodated in a casing sealed at one side by a membrane disposed between a feeler of said transducer and said plate.

8. A system according to claim 1, wherein said timepiece has a control input having an operating threshold above the signal produced by static bias and waves in the swimming basin.

9. A time measuring system for swimming competitions, comprising a plate to be attached to a wall of a swimming pool, means for producing an electric signal upon touching of said plate, a time counter adapted to be controlled by said signal, at least one contact-free electromechanical transducer operable for producing said electric signal upon touching of the plate, and a differentiating circuit in the transmitting canal for said signal and a control input in said time counter operable by the differentiated signal.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,676,696 Dated July 11, 1972

Inventor(s) Francois J. Leu et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

The assignee should read

-- Omega Louis Brandt and Frere S.A. Bienne,

Canton of Berne, Switzerland, --.

Signed and sealed this 17th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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