United States Patent

Stalp

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[54] TOUCH-OPERATED SIGNAL PRODUCER

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[52] **U.S. Cl.** .....**340/323**, 200/83 R

[51] **Int. Cl.** **G08b 5/22**

[58] **Field of Search** .....340/323, 261; 200/86 R, 83 R

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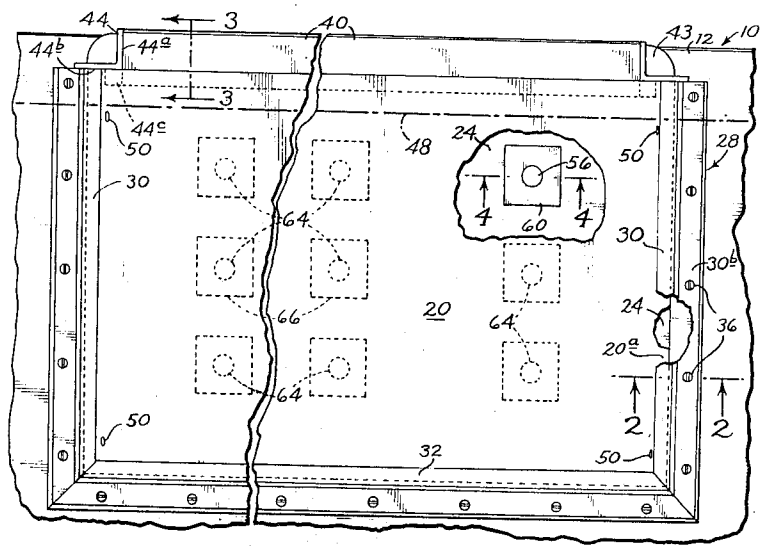
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[57] **ABSTRACT**

A submersible touch-operated signal producer including a pair of spaced, opposed walls sealingly connected at their edges to define a fluid-retaining chamber therebetween. One of the walls is flexible, and when it is touched, it deflects to produce a disturbance in fluid held between the walls. A transducer having a pair of output terminals is mounted in the container and is actuated by such disturbance in such fluid to produce a signal at its output terminals which actuates a remotely located timer circuit.

6 Claims, 5 Drawing Figures



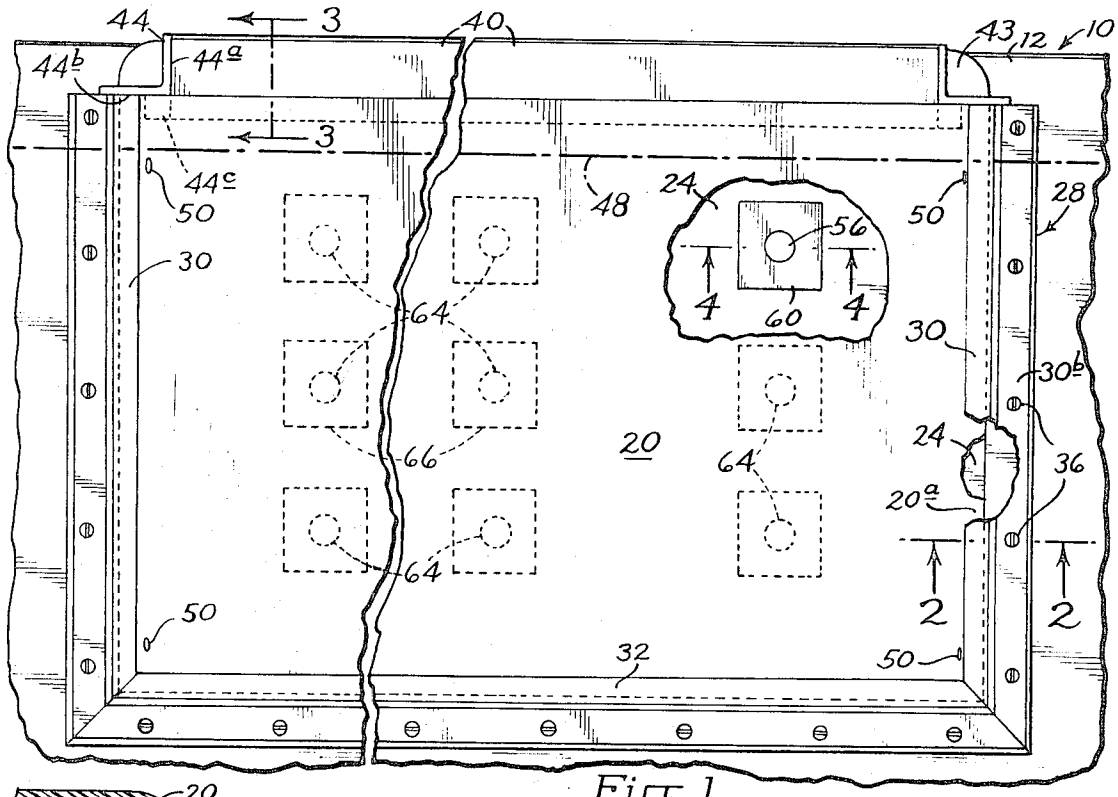


Fig. 1.

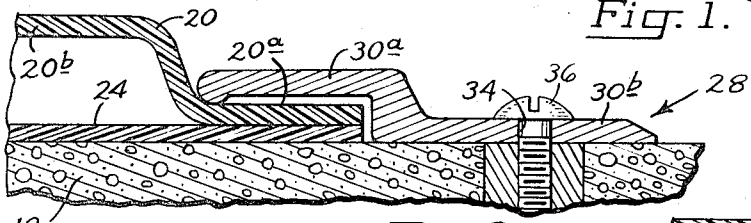


Fig. 2.

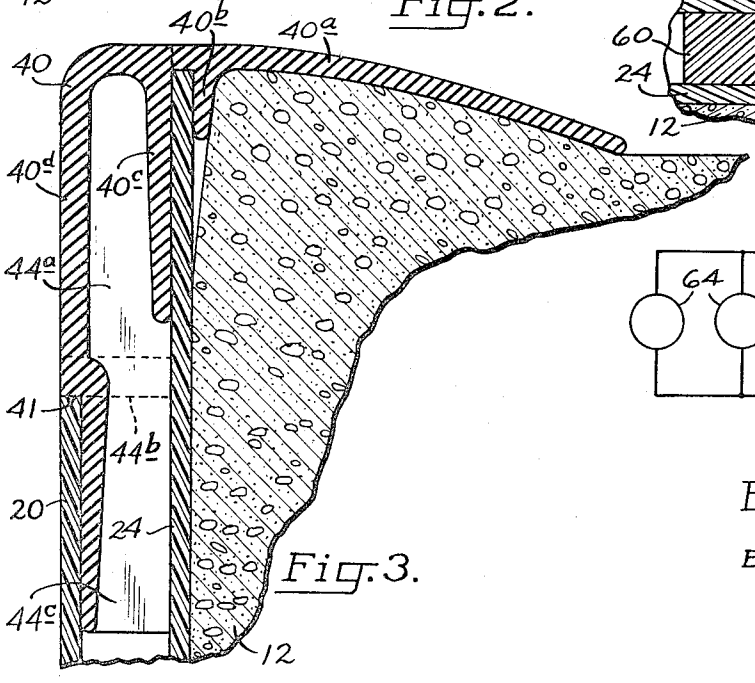


Fig. 3.

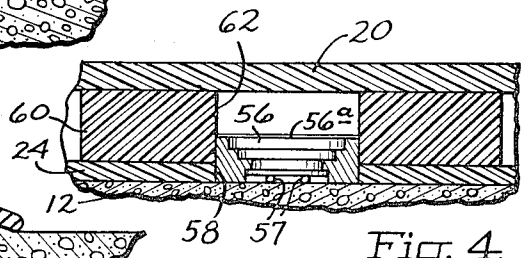


Fig. 4.

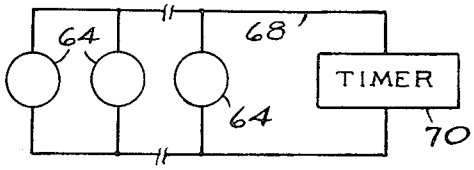


Fig. 5.

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TOUCH-OPERATED SIGNAL PRODUCER

This invention relates to a touch-operated signal producer. For purposes of illustration, a preferred embodiment of the invention is described as it might be used in timing competitive swimming.

In competitive swimming, both during practice and during a meet, it is often desired to note the elapsed time for each swimmer to complete an event. In the past, such times have, for a number of reasons, been difficult to obtain accurately. Frequently, a swimmer's elapsed time is obtained by an observer employing a manually operated stop watch. Such a practice, which relies on the reactions of the observer, clearly opens the door to inaccuracies. Swimming races generally end at an end of the pool with the observer noting the instant at which an individual swimmer touches the end of the pool. This introduces another area for inaccuracy, through faulty observation.

In competitive swimming, the times of competing racers are often so close that even through times are calculated to one one-hundredth of a second, ties will develop, necessitating runoffs. To obviate these runoffs, attempts have been made to time events to one one-thousandth of a second. However, a human observer cannot use a stop watch this accurately. A need thus has arisen for a device to be actuated by a swimmer himself at the conclusion of a race to signal the end of the race, which device has fast response and is reliable.

A general object of the invention is to provide a novel touch-operated signal producer which may be operated by a competitor to take care of the above-mentioned difficulties in a practical and satisfactory manner.

Another object is to provide such a signal producer which is submersible, and may be secured to the wall of a swimming pool in a region where it may be touched by a swimmer at the end of a swimming lap.

Thus, according to a preferred embodiment of the invention, the signal producer includes a pair of spaced walls defining a fluid-retaining chamber therebetween with one of the walls being flexible. When it is touched, it deflects to produce a disturbance in fluid within the chamber. The signal producer further includes a transducer, having a pair of output terminals, which is actuated by this disturbance and produces a signal at its output terminals when actuated. The output terminals of the transducer are connected to a remotely located electronic timer.

These and other objects and advantages will become more fully apparent as the following description is read in conjunction with the drawings wherein:

FIG. 1 is a front view of a signal producer as contemplated, with portions broken away;

FIG. 2 is an enlarged sectional view, taken generally along the line 2—2 in FIG. 1;

FIG. 3 is an enlarged sectional view taken generally along the line 3—3 in FIG. 1;

FIG. 4 is an enlarged sectional view taken generally along the line 4—4 in FIG. 1; and

FIG. 5 illustrates schematically the signal producer connected to a timer.

Referring now to the drawings, in FIG. 1 the signal producer is illustrated generally at **10**. Such is shown mounted on the end wall **12** of a pool. One of such signal producers normally would be provided for each lane in the pool.

The signal producer includes a pair of closely spaced, opposed, rectangular and substantially planar plastic plates, or walls, **20**, **24**. The plates are disposed vertically and substantially parallel to each other. One side of plate **24** (the back plate) rests against wall **12***a* of the pool. The side and bottom edges of plate **20** (the front plate), as illustrated in FIG. **2**, coincide with corresponding edges in plate **24**. The top edge of plate **24**, however, is spaced a slight distance above the top edge of plate **20** (see FIGS. **1** and **3**).

Adjacent the side and bottom edges of plate **20** are elongated margins such as those shown at **20***a* which are laterally offset from the central expanse **20***b* of the plate. These margins rest against plate **24** as seen in FIG. **2**. Due to the offset, expanse **20***b* is positioned a slight distance away from plate **24**. Expanse **20***b* is flexible and may be deflected toward plate **24**.

A three-sided frame indicated generally at **28** secures plates **20**, **24** to wall **12***a* of the pool. The frame includes a pair of vertical, laterally spaced-apart, elongated frame members **30**, and a substantially horizontal base frame member **32** which interconnects members **30**.

The frame members have similar cross sections. Referring specifically to frame member **30** illustrated in cross section in FIG. **2**, it includes an elongated flange **30***a* joined to another elongated flange **30***b*. The flanges are laterally offset. Flange **30***a* overlies a margin **20***a* of plate **20** and flange **30***b* rests against wall **12** of the pool. Flange **30***b* contains a series of spaced bores exemplified by bore **34**, extending therethrough, which receive screws **36** which anchor the frame member on the wall.

An elongated cover piece **40**, which may be an elastomer extrusion, is secured to the upper margins of plates **20**, **24**. As is best shown in FIGS. **1** and **3** the cover piece includes a back flange **40***a* which overlies the top of the end wall in the pool, depending ribs **40***b*, **40***c* which receive the upper margin of back plate **24** with such sandwiched between the ribs, and a depending forward flange **40***d*. Such is stepped at **41** to provide a proper seat for the top margin of front plate **20**. The member may be adhered to plates **20**, **24** where such lies adjacent to regions of these plates.

Adjacent the ends of cover piece **40** are plugs shown at **43** and **44**. The two plugs are similar and with reference to plug **44**, such includes a face **44***a* closing off an end of the cover piece. At right angles to this face is another face **44***b* closing off the top end the member **20** on which the plug rests. A projection **44***c* at the base of the plug helps to anchor it in place.

The usual water level in the pool may be at the level indicated at **48** in FIG. **1**. As shown in FIG. **1** the signal producer is mounted on the end wall of the pool with a major portion of the signal producer submerged in the water of the pool. Front and back plates **20**, **24**, the frame members securing these plates to the end wall of the pool, and cover piece **40** together form what is referred to herein as a container. The water of the pool is permitted to flow into the interior of this container through multiple openings **50** provided in front plate **20** adjacent its side margins. The holes are not large. In this way the water which does find its way into the interior of the container is more or less isolated, insofar as water movement is concerned, from the water which fills the pool.

Referring now more particularly to FIGS. **1** and **4**, shown at **56** is a transducer having a sensing surface **56***a* over the front thereof. The transducer, which includes a protective plastic covering, such as a polyurethane covering is sensitive to compressional wave energy in water and is actuated by sensing such energy through its surface **56***a* to produce an electric signal at its output terminals **57**. The transducer is mounted, as by cementing, it within a bore **58** in plate **24**. An open-cell sponge pad is shown at **60**. The pad includes a central bore **62** which is positioned over the transducer. The pad, which may be cemented over its front to the back side of plate **20** and over its rear to the forward side of plate **24**, functions properly to space the front and rear plates in the direct vicinity of a transducer. Being of an open-cell foam, the sponge pad easily fills with water and water is permitted to flow through the pad into the region of bore **62**. The pad is deformable and compresses to accommodate movement of plate **20** toward plate **24**, such as is produced by someone touching plate **20**.

Shown at **64** by circular dotted outline in FIG. **1** are additional transducers which may be similar in construction and mounting to the transducer just described. Associated with each transducer **64** is a sponge pad **66** similar in construction and functioning to pad **60**. The multiple transducers which are mounted opposite front plate **20** at points distributed over the area of said front plate, impart a high degree of sensitivity and rapidity in response to the signal producer.

As best seen in FIG. **5** the various transducers have their output terminals connected in parallel and through an electri-

cal circuit 68 to an electronic timer 70. On an electrical signal being produced at the output terminals of any transducer such actuates the timer.

Explaining the operation of the signal producer and how it may be utilized in timing a swim meet, with the signal producer mounted as shown in FIG. 1 and in a swimming pool filled with water, ambient surface wave motion in the water of the pool will be ineffective to actuate any of the transducers described. On a swimmer completing his event, he strikes the front plate of the signal producer and such produces a sound wave, or compressional wave, in the water contained within the signal producer. Such is sensed almost immediately by the transducer closest to the point of contact, with this transducer then actuating the timer as described. The timer ordinarily will be actuated at the start of the event to commence timing a given swimmer's time and on being subsequently actuated through the swimmer striking the signal producer of the invention, the timer then displays the timer which it has taken the swimmer to complete the event.

By providing multiple transducers, with such being relatively closely laterally spaced from each other, the reaction time of the signal producer is reduced to a minimum. In fact, with the signal producer of the invention it is possible to measure the elapsed time of an event to within one one-thousandth of a second.

While a particular preferred embodiment of the invention has been described it is appreciated that changes and variations are possible both in construction and functional operation without departing from the spirit of the invention.

It is claimed and desired to secure by Letters Patent:

1. A touch-operated signal producer comprising a container for holding a fluid, said container having a flexible fluid-retaining wall which deflects when touched to produce a disturbance in fluid contained therein, and transducer means having a sensing surface and a pair of output terminals, said transducer means being mounted with its said surface in a position to sense a disturbance in fluid within the container as results from flexing of said wall and absent being contacted by said wall on flexing, said transducer means being constructed to produce an output signal at said terminals upon sensing such a disturbance.

2. The signal producer of claim 1, wherein said container is submersible in fluid and has an opening therein permitting fluid flow between the interior and exterior of the container.

3. The signal producer of claim 1, wherein said container has another wall spaced from and opposing the flexible wall, and means joins said walls adjacent their peripheral edges to define a substantially enclosed fluid-retaining chamber therebetween.

4. The signal producer of claim 3, and in combination with a swimming pool having an end wall at one end thereof, said signal producer being mounted against said end wall.

5. A touch-operated signal producer comprising

a submersible container for holding fluid having an opening therein permitting fluid flow between the interior and exterior of the container, said container including means operable when touched to produce a disturbance in fluid contained therein, and

transducer means having a sensing surface and a pair of output terminals, said transducer means being mounted with its said surface in a position to sense a disturbance in fluid within the container and being constructed to produce an output signal at said terminals upon sensing such a disturbance.

6. The signal producer of claim 5, wherein said transducer means comprises a plurality of transducers mounted opposite said wall in said container at points distributed over said wall.

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