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Title: "Device for use by sportsmen and sportswomen"

THIS INVENTION relates to a device for use by sportsmen and women in assessing their performance.

5 According to one aspect of the invention there is provided a device
for use by, for example, sportsmen and sportswomen in assessing perform-
ance, incorporating means for emitting sounds to communicate information
to the user, and means whereby the user can provide signals to the device,
the device incorporating means for performing a counting and/or timing
10 function related to the particular activity concerned, and for actuating said
sound emitting means in correlation with the carrying out of said function.

15 In a preferred embodiment, there is provided a device for use by
sportsmen or sportswomen in training and incorporating means for emitting
audible signals in a predetermined sequence and at pre-determined intervals
following a manual triggering operation to simulate a race-start sequence,
and means for initiating timing of a period elapsing from a predetermined
signal in said sequence, until a further stop-signal supplied subsequently to
the device.

20 The device may be adapted to be secured to the user's body and may
incorporate sensing means for sensing movements made by the user in
carrying out the particular activity concerned, for example for detecting
the execution of successive strokes by a swimmer or the making of
successive paces by a runner, and means for counting the number of
25 successive strokes, paces, or the like, executed.

30 Thus, according to another aspect of the invention there is provided a
device for use by swimmers in assessing performance, the device being
adapted to be secured to a swimmer's body and incorporating sensing means
for sensing movements made by the swimmer in swimming and thereby

detecting the execution of successive strokes, and means for counting the number of successive strokes executed.

5 The sensing means may, according to this aspect, be sensitive to the orientation of the force of gravity relative to the device, whereby the execution of successive strokes may be determined by changes in the orientation with respect to the vertical part of the swimmer's body to which the device is attached, during each stroke.

10 Alternatively, or in addition, the sensing means may be sensitive to accelerational or decelerational forces arising from the movements of the device, and the part of the swimmer's body to which the device is attached.

15 The sensing means may include a two sensors, a first one of which is sensitive to the orientation of the force of gravity relative to the device and the second of which is sensitive, for example, to accelerational or decelerational forces. The first sensor may be utilised, for example, for strokes in which the arms of the swimmer move in a manner which approximates roughly to rotation about a horizontal axis, for example the freestyle or crawl stroke. The second sensor may be utilised for strokes in which the inclination of the swimmers limbs relative to the vertical may vary in a less pronounced manner, for example the breast stroke.

20 The first sensor, in this instance, may comprise, for example, a small weight, such as a metal ball, guided for free movement between limiting positions, in one of which the weight operates a detector to provide a signal, so that each time the weight moves to said one limiting position a respective signal is produced. The weight may comprise, for example, a pivotally mounted weight, a metal ball confined within a tube or the like arrangement. Thus, assuming the device to be attached to the swimmer's wrist, for every stroke which the respective arm completes, the weight will be moved to said one limiting position at least once during every stroke to operate the detector and produce a respective signal.

35 The second sensor, sensitive to acceleration or deceleration of forces, may likewise comprise a weight mounted for movement between the limiting positions, but in this instance urged towards a predetermined

position by a spring or the like so that only when the device is subjected to acceleration or deceleration can the weight be moved from its normal position to operate a detector. Alternatively, the first and second sensors may be constructed virtually without moving parts, for example being
5 constructed as an electronic load-sensing device such as a piezo-electric cell, strain gauge or the like with a small weight mounted thereon.

Provision may be made whereby the swimmer can select, by operation of said input means, which of the two sensors is effective to
10 determine when a stroke has been executed. However, it will be appreciated that it is possible for both sensors to remain effective whenever the device is in use and for the device to incorporate processing means whereby the signals produced by the two sensors and the variations of these signals with time, and the inter-relationship of these signals to one another
15 can be analysed, to provide a reliable detection of the execution of a stroke. For example, the arrangement may be such that the device may be placed by operation of the input means, in a calibrating state in which the substantially repeating cycle of signals produced by the sensors during the execution of repeated strokes in swimming in a particular style is recorded,
20 whereafter the device may be set in a normal state in which repetition of each cycle of the corresponding sequence will be interpreted by the processing means as the detection of the execution of a respective complete stroke.

Other means of detection may be utilised, of course. For example
25 the device may incorporate a light sensor, a sensor of the dielectric constant of the medium around the device, a pressure sensor or the like whereby fluctuation in these quantities during swimming, e.g. as a swimmer's arms are withdrawn from and returned to the water, will provide
30 a detection of the execution of a stroke.

Where the sensors operate substantially by sensing accelerational or decelerational of forces, they may be so contrived as to be capable of detecting the slight impact produced by the swimmer's limbs breaking the
35 water surface. Likewise such sensors may be arranged to detect the somewhat sharper impact which may be produced either deliberately or as a matter of course by the swimmer striking the end of the pool at the

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