A velocity indication system is comprised of a force measurement sensor shielded by a protective covering that measures the level of force at the point of impact of the sensor with an object, and transmits the measurement, via a transmission carrier, to a computing unit that calculates the force measurement into a velocity measurement and projects that information on a display. A system carrier has an impact and a holding area. The invention is designed for use in sports such as hockey, tennis, baseball, cricket, golf, and the like; generally a sport with a racquet or stick.
Fig. 3
SPORT APPARATUS WITH IMPACT SENSING AND DISPLAY

[0001] RELATED APPLICATIONS: This application claims the priority of an earlier filed Canadian application filed on Jul. 17, 2001 with application Ser. No. 2,354,338.

[0002] INCORPORATION BY REFERENCE: Applicant(s) hereby incorporate herein by reference, any and all U.S. patents, U.S. patent applications, and other documents and printed matter cited or referred to in this application.

BACKGROUND OF THE INVENTION

[0003] 1. Field of the Invention

[0004] This Invention relates to a system for indicating the velocity of an object. More particularly, this invention relates to a system that determines information which can be used to calculate or infer the velocity of an object by measuring the force at the point of impact with a sensor that is attached to a carrier.

[0005] 2. Description of the Related Art

[0006] The prior art relevant to this invention, and described below, consists of various systems and devices for measuring the velocity of an object, the distance traveled by an object or the location of the point of impact of an object on an implement. It is thus known in the art that the velocity of an object may be measured or inferred by using sensors and that the measurement or the inferred velocity may be displayed on a display.

[0007] U.S. Pat. No. 4,088,324 to E. W. Farmer, filed Dec. 6, 1976, is a device for measuring the impact between an implement and a struck object and for displaying the distance traveled by the object. The device is comprised of motion sensors, a signal circuit, an environmental correction circuit and a display. The Farmer patent suffers from the fact that it requires a motion sensor that is responsive to the distance traveled by the object.

[0008] U.S. Pat. No. 4,801,880 to K. Eishi, filed Nov. 28, 1986, is a device for measuring the speed of a moving object. The device is comprised of movement start and finish detecting means, a time measuring means, a speed computing means and a display unit. The Eishi patent suffers from the fact that it requires a movement detection and time measuring means.

[0009] U.S. Pat. No. 4,898,389 to D. J. Plutt, filed Sep. 8, 1987, is a device for golf training. The device is comprised of a golf club with an impact sensitive transducer which generates an electrical signal and has an electrical signal receiver to determine the location of the point of impact of the object on the club face. The Plutt patent suffers from the fact that it requires electrical signals to determine the location of the point of impact between the club-face and the struck object.

[0010] U.S. Pat. No. 5,419,565 to T. J. Gordon et al, filed Aug. 20, 1993, is an electrical device for detecting the location and speed or force of impact with a target. The device is comprised of a projectile target with an elastomeric enclosure and a matrix. The Gordon patent suffers from the fact that it requires measurement of the impact of an object on a stationary matrix target.

[0011] U.S. Pat. No. 5,688,183 to J. Sabatino, filed Mar. 21, 1995, is a velocity monitoring system for golf clubs. The system is comprised of a golf club, a monitor, and an acceleration sensor that generates a noise reading. The Sabatino patent suffers from the fact that it requires a noise reading to calculate club speed.

[0012] Canadian Patent No. 2,146,527 to M. Tison et al, filed Apr. 6, 1995, and laid open Oct. 7, 1996, is an apparatus for measuring the speed of a hockey puck. The apparatus is comprised of a simulative puck, a guide track and a computer system. The Tison patent suffers from the fact that it requires a guide track and special puck.

[0013] U.S. Pat. No. 5,806,048 to B. D. Edward, filed Jul. 23, 1996, is an apparatus for determining the speed of a projectile. The apparatus is comprised of a control logic unit with a pulsating clock and an acoustic sensor. The Edward patent suffers from the fact that it requires an acoustic sensor and a timer.

[0014] U.S. Pat. No. 6,212,129 to M. Nussbaumer, PCT filed Sep. 19, 1997, is a device for measuring the velocity of a variety of objects. The device is comprised of a base unit with a sound wave emitter, a sound wave receiver, a computing unit and a display screen. The device is placed next to the projected line of movement of the object. The Nussbaumer patent suffers from the fact that it requires a sound wave emitter and receiver, and Doppler effects to measure projectile speed.

[0015] Canadian Patent No. 2,248,114 to A. E. Dilz, filed Nov. 24, 1997, and laid open on Aug. 6, 1998, is a miniature sports radar speed measuring device. The device is comprised of a radar in the form of a microwave frequency transmitter and a receiver. The Dilz patent suffers from the fact that it requires a radio transceiver and Doppler effects to measure speed.

[0016] U.S. Pat. No. 6,173,610 to R. L. Pace, filed Dec. 23, 1998, is a sports swing impact speed indicator. The device is comprised of an accelerometer, an event window timer and a LCD. The Pace patent suffers from the fact that it requires a timer and a sensor to measure speed.

[0017] PCT Patent No. WO 01/00285 to Y. C. Pao, filed Jun. 24, 1999, is a method and apparatus for a portable golf training system with an optical sensor net. The device is comprised of an optical sensor net system that utilizes light emitters. The Pao patent suffers from the fact that it requires an optical net, sensors, receptors and interference to measure club speed.

[0018] U.S. Pat. No. 6,157,898 to D. J. Marinelli filed Jul. 1, 1999, is a measuring device that uses multiple sensors to determine the speed, spin rate and curve of a movable object, such as a baseball or hockey puck, through space. The device is comprised of an accelerometer network, an electronic processor circuit, a radio transmitter and a monitor unit. The Marinelli patent suffers from the fact that it requires a complex radio method.

[0019] The existing prior art inadequately addresses the need for an inexpensive, transportable, and easy to use, single user system for indicating or inferring the velocity of a struck object by measurement taken at the point of impact. None of the prior art discloses an invention that utilizes a durable force measurement sensor, attached directly to the
area of impact on the system carrier, that transmits the force measurement via a transmission carrier to a computing unit, located near the holding area of the system carrier, that calculates the velocity of the object at the point of impact with the sensor and conveys that information on a display and permits the user to manipulate that information into various formats via option buttons. The present invention fulfills these needs and provides further related advantages as described in the following summary.

SUMMARY OF THE INVENTION

[0020] The present invention teaches certain benefits in construction and use which give rise to the objectives described below.

[0021] The preferred embodiment of the invention is comprised of four elements: a force measurement sensor with protective covering; a transmission carrier; a computing unit with display and option buttons; and a system carrier with impact area and holding area. These elements are applied, as a system for indicating or inferring the velocity of an object from measurements taken at a point of impact.

[0022] The Invention in its preferred embodiment is designed to be used with a sporting equipment system carrier, such as a hockey stick, to indicate the velocity of an object, such as a puck or ball, at the point of impact with the force measurement sensor located on the impact area of the carrier, such as the blade of the hockey stick, and convey an indication of the velocity measurement to the user on a display also located on the carrier, such as an LED located near the handle of a hockey stick. This enables players of all ages, without the necessity of expensive radar devices and without the presence of another person, to immediately determine an indication of the velocity of the puck or ball by inference from the measured force at the point of impact with the stick, and utilize that information to experiment so as to improve, develop and monitor the progress of skills necessary to increase the velocity and efficiency of the shot, hit or strike.

[0023] The Invention thus accomplishes the goal of developing an affordable, portable and easy to use system for displaying an indication of the velocity of a struck object, that may be used by children and adults for hockey, golf, baseball, martial arts and other sporting and striking activities.

[0024] These and other objects and advantages of the Invention are apparent in the following detailed description and the accompanying drawings, of the preferred embodiment of the invention, which is not intended to limit in any way the scope or the claims of the Invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The accompanying drawings illustrate the present invention. In such drawings:

[0026] FIG. 1 is an exploded perspective view of the preferred embodiment of the invention;

[0027] FIG. 2 is a partial view thereof showing, assembled, a lower and an upper portions; and

[0028] FIG. 3 is a logic flow diagram thereof defining a preferred operation.

DETAILED DESCRIPTION OF THE INVENTION

[0029] The above described drawings illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description.

[0030] FIG. 1 illustrates a preferred embodiment of the Invention, which comprises a force measurement sensor 1 with protective covering 9, transmission carrier 2, computing unit 3, with display 4, option buttons 5, and a system carrier 6, with impact area 7, and holding area 8.

[0031] The transmission carrier 2 is embedded within or affixed to the exterior of the length of the body of the system carrier so that one end of the transmission carrier 2 is located at the impact area 7 and the other end is located near the holding area 8. The end of the transmission carrier 2 nearest to the impact area 7 is connected to the force measurement sensor 1 and the end of the transmission carrier 2 nearest the holding area 8 is connected to the computing unit 3. The force measurement sensor 1 is attached firmly within the impact area 7 of the system carrier 6 and the computing unit 3 is attached in a convenient location near the holding area 8 of the system carrier 6 in such a manner that will not impede the user’s ability to hold the system carrier 6. A protective covering 9 is attached to the impact area 7, directly over the force measurement sensor 1. The system carrier 6 is used to contact an object in such a manner that the object contacts the system carrier 6 in the impact area 7, preferably near the middle of the force measurement sensor 1. Upon impact, the force measurement sensor 1 measures the force of the impact of an object with the force measurement sensor 1. This force measurement is transmitted to the computing unit 3 via the transmission carrier 2. The computing unit 3 receives the force measurement and uses this measurement to calculate the estimated velocity of the object at impact, and projects the estimated velocity on the display 4. The user may manipulate the read-out of the information on the display 4 by pressing the option buttons 5. Upon the depression of an option button 5, the computing unit 3 will manipulate the velocity measurement according to the desired manipulation. The option buttons 5 may include manipulations such as turning the display 4 on and off, averaging the velocity measurements, resetting the computing unit 3, and changing the unit of measure for the velocity reading.

[0032] The preferred construction is as shown in FIG. 1, wherein the system carrier 6 is split into two halves and each of the halves includes recesses 1, 2 and 3 defined to receive the sensor 1, the carrier 2 and the computing unit 3 respectively. The recesses are sized to hold the respective elements tightly so that inertial forces cannot damage them.

[0033] All components of the Invention may be comprised of any device and material suitable, including but not limited to a force detection sensor comprised of electronic components embedded in an elastomeric or plastic covering; a transmission carrier comprised of electrical wire or cable; a computing unit housing comprised of metal, aluminum or plastic; a computing unit display comprised of a LED display or a LCD; a system carrier comprised of wood, aluminum, metal or plastic; and a protective covering comprised of elastomeric, plastic or Plexiglas. The references incorporated in this application clearly define the steps necessary to produce the several elements or components and to provide for their interconnection and operation.
FIG. 3 defines the logical operation of the computing unit 3. After power is turned on, the unit 3 initializes. This step is very well recognized in the art. The circuit remains in a “sleep” low power consumption mode until brought to active mode by the pressing of any button 5. This type of circuit is very well known in the art. Next, the logic searches for which key has been activated, including the OFF key, the velocity units selection key, the “RESET” key, and the “AVERAGE” key. These produce the actions of: toggling between kilometers per hour and miles per hour; clearing the display 4; and calculating an average, respectively depending upon which button 5 was depressed. Such operations are very well known in the art and the circuit elements and configurations needed to achieve them are well known as well. If the OFF key has not been actuated and none of the foregoing buttons 5 have been activated, as well, the logic reads the signal from the sensor 1. If there is none, the cycle repeats. If there is, speed is calculated and displayed in accordance with the selected units. Timeout and low battery functions are provided as is well known in the art.

The above apparatus may be alternately described as follows. A sport apparatus comprising: a force measuring means 1 engaged within an impact portion 7 of the sport apparatus; a computing and displaying means 3 engaged within a hand-held portion 8 of the sport apparatus; and a signal transmitting means 2 joining the force measuring means 1 and the computing and displaying means 3 for carrying information from the force measuring means to the computing and displaying means; the computing and displaying means 3 providing means for converting the signal from the force measuring means into a velocity and for displaying said velocity. Such converting means is preferably a computer calculation using a normalizing factor determined by trial using a selected force sensing transponder device such as pezio element, an accelerometer, strain gauge, etc.

Preferably, the computing and displaying means 3 provides functional buttons 5 adapted for selecting power status, clearing a display screen of the computing and displaying means, selecting units of the velocity values displayed on the display screen, and averaging plural of the displayed values. Of course, other functions could be applied as desired in a particular sport.

Preferably, the sport apparatus is formed of two mating halves which may be fastened into an integral unit using any system of fastening known to the art. One, or both, of the halves provides a recess 1; 2; 3 for accepting the force measuring means 1, the computing and displaying means 3 and the signal transmitting means 2 in tight-fitting engagement; critical to avoid inertial force damage to these components.

While the invention has been described with reference to at least one preferred embodiment, it is to be clearly understood by those skilled in the art that the invention is not limited thereto. Rather, the scope of the invention is to be interpreted only in conjunction with the appended claims.

What is claimed is:

1. A sport apparatus comprising: a force measuring means engaged within an impact portion of the sport apparatus; a computing and displaying means engaged within a hand-held portion of the sport apparatus; and a signal transmitting means joining the force measuring means and the computing and displaying means for carrying information from the force measuring means to the computing and displaying means; the computing and displaying means providing means for converting the signal from the force measuring means into a velocity and for displaying said velocity.

2. The apparatus of claim 1 wherein the computing and displaying means provides functional buttons for selecting power status, clearing a display screen of the computing and displaying means, selecting units of the velocity values displayed on the display screen, and averaging plural of the displayed values.

3. The apparatus of claim 1 wherein the sport apparatus is formed of two mating halves, wherein at least one of the halves provides a recess for accepting the force measuring means, the computing and displaying means and the signal transmitting means in tight-fitting engagement.

4. The apparatus of claim 1 wherein the computing and displaying means provides means for initializing, initiating a low power consumption mode, identification of button selection, averaging plural measurements, and producing readings on the display related to the force sensed, and therefrom converting to a velocity.