Title of the Invention: Drum unit interface for mobile phones, audio players and tablet computers
Abstract Title: Electronic drum module comprising a support and audio connection for a mobile device

The invention is an electronic drum module comprising a body 12 with a support for connecting a cradle 1, which holds a mobile device such as a smartphone or tablet computer. The support preferably is mounted on a frame 6 of the electronic drum kit and accepts signals from the drum kit triggered by a user striking drum pads 5, 7, 8, 9 and cymbal surfaces 4. The body contains at least one audio input and audio output, plus at least one trigger input. The trigger input(s) may be 3.5mm jack audio style connectors. A percussive source, connected to the trigger input via a cable, is received by a microprocessor housed within the body. The microprocessor processes the trigger signal to generate an output signal which is transmitted via a cable to the mobile device. The mobile device then uses the signal to generate an audible percussive sound. The signal may be transmitted to an external computer, using MIDI data, for further processing. USB ports (13) may be provided to charge the mobile device and update firmware. A combination of magnets may be used to interlock the body and cradle.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.
fig 10
**Background of the invention**

1. **Field of the invention:**
The present patent document is directed generally to electronic percussion instruments and more particularly to a module for electronic drum kit designed for mobile phones, audio players and tablet computing devices.

2. **Background of the Related Art**
The advantages of electronic drum kits over acoustic kits are well known in the art. Such advantages include the ability to play a wide variety of drum sounds, the ability to play with reduced or very minimal acoustic noise, and more compact drum pad setup. Electronic drum kits include a number of drum pads and often cymbals. The electronic drum pads or cymbals usually include a piezo electric device inside the drum pad or cymbal that detects a physical strike against a drum pad or cymbal and generates an electronic signal in response. The electronic drum kits further include a drum trigger module that includes inputs for detecting physical strikes against one or more drum pads or cymbals and generates an electronic drum tone representative of the strike. Prior art drum modules suffer from a number of disadvantages. In particular, prior art drum modules have limited numbers of percussion sounds, the quality of the pre-recorded sounds is often poor, the digital signal processing capability lacks fidelity and features and user interface is often confusing and difficult to use. Although high-end electronic drum kits exist with improved features, these high-end systems cost many thousands of dollars, which is prohibitively expensive for most drummers and not even taken into consideration by aspiring drummers. Accordingly, there is a need in the industry for an inexpensive electronic drum kit that includes high-end features only found on deluxe and highly expensive systems.

**Object and summary of the invention**
The present invention solves the problems of the prior art by providing an improved number of sounds, higher quality of sounds, enhanced digital signal processing power, and an enhanced user interface at a lower cost by interfacing with the user's existing mobile phone, specific audio music player or tablet computing device, such as the Apple iPhone, Apple iPod and Apple iPad (hosted devices).

With this invention in fact a musician would be capable of transforming its personal device, for example its smart phone, into a high-performance drum module with improved connectivity and contained dimensions.

The main advantage of this approach is the use of the advanced technology made available by today's personal devices manufacturers and the popularity that such devices have encountered in the everyday life. Due to the continuous innovations in the personal devices industry, mobile phones, personal audio players and tablet computers suffer by a rapid obsolescence feeding the market with more powerful CPUs, increased memory, new interactive features and improved connectivity.

A substantial feature of the presented drum unit interface is that it makes the samples and the user experience to be independent from the drum unit hardware, in fact the drum module composed by the accessory object of this invention can communicate with the enclosed hosted device through the well known MIDI protocol, which is the
common way to exchange data amongst professional music software. Where the MIDI protocol is not available, such as on Android based hosted devices, the drum unit interface can include its own internal audio module.

New features can be added with ease, as the user only needs to acquire new software or sounds in the standard manner extensively provided by its device manufacturer, via wireless from another device or through its Internet connection.

Thanks to the hosted device’s front camera it is possible to record video of the performance from the desired perspective thanks to the contained dimensions of the device and the versatility of the mount bracket.

Another innovation of the present invention is represented by the input connectors, all of which are stereo and entirely configurable, via software, by the user to allow for custom assignment and configuration of pads, cymbals and footswitches.

**Description of the drawings**

These and other features, aspects, and advantages of the present invention will become better understood with reference to the following description, appended claims, and accompanying drawings where:

FIG. 1 is a perspective view of a standard electronic drum kit showing the electronic drum module of the present invention;

FIG. 2 is a top view of the electronic drum module of the present invention showing a mobile phone device docked therein;

FIG. 3 is a left side view of the electronic drum module of the present invention;

FIG. 4 is a rear view of the electronic drum module of the present invention;

FIG. 5 is a section view of the electronic drum module of the present invention;

FIG. 6 is a right side view of the electronic drum module of the present invention;

FIG. 7 is a representation of the Mounting Bracket that allows the present invention to be connected to any mounting support.

FIG. 8 is a representation of the Apple iPhone 4 cradle for the present invention.

FIG. 9 is a representation of the Apple iPad 2/Apple iPad 3 cradle for the present invention.

FIG. 10 is a schematic view of the embodiment of the electronic drum module of the present invention.

**Detailed description of the preferred embodiment**

FIG. 1 shows a simple configuration for an electronic drumkit including a drum stand 6, a number of electronic drum pads 5,7,8,9 and electronic cymbals 4 secured to the drum stand 6 and the electronic drum module object of the present invention 1,2,3,12.

Foot pedals 10,11 may also be included for simulated high-hat cymbals and to kick a bass drum 9. The drum pads 5,7,8,9 may be configured to simulate acoustic kick, snare and tom-tom drums.

The electronic drum module 1,2,3,12 of the present invention includes a body 12 and a set of separate cradles as represented in 1 for mobile phones and 33 (FIG. 8a and 8b) for Tablet devices. The drum module 12 further includes a number of inputs, preferably located on a side panel 14 of the drum module 12 configured to receive a number of trigger cables from drum pads 5,7,8,9 and electronic cymbals 4 of an electronic drum kit, which will be described in more detail below.

Referring to FIG. 2, the electronic drum module 12 includes a front face 12, iPhone cradle 1 with a slot accurately configured to accommodate and hold an iPhone mobile device 2 and a top view of the mounting bracket 3 that allows the drum module 12 to
be held on the drum stand 6 through common clamps and L-rods commonly available allowing for the orientation that most suit the musician.

Referring to FIG. 3, a left side of the electronic drum module 12 is shown. The electronic drum module 12 may further include a number of MIDI-USB port 13 to permit the MIDI data from the electronic drum module 12 to be transmitted to a personal computer for further processing. The USB ports (example in 13) can be used to charge the phone while connected to the device 12 and to update the firmware whether this is needed as an upgrade made available by the manufacturer or to be connected to a personal computer or other external devices, such as flash drives and external hard drives. The USB ports may be of any type known in the art. A standard audio output 15 is provided, and it may be of any type known in the art. The electronic drum module 12 includes a number of stereo input connectors 14 to be configured as single or double triggered cymbals, single or double triggered pads, footswitches which are often configured to simulate a high-hat cymbal or kick drum. The inputs 14 are suggested to be 1/8 inch jack connectors to minimize space available and contain dimensions but may vary to any type known in the art.

FIG. 3 shows also a side view of the mounting bracket 3 and its accessories as mount fixing 17 and mount lock 16 that consists of a commonly replaceable wing screw.

FIG. 4 shows the back of the drum module 12 where the mounting bracket 3 protrudes out as shown in 3b within the cavity made on purpose for unlocking. Pushing the mount bracket 3b in fact unlocks it from the body 12 of the device.

FIG. 5 refers to a section of the entire device showing the body 12, the mounting clip 21 that locks the mounting bracket to the device, the hosted device's connector 22, the PCB 18, the Apple iPhone cradle 1 the Apple iPhone itself 2, the interlocking mechanism consisting of a set of neodymium magnet and oppositely a metal plate 20. The magnet can be moved further into the cradle if interference with the hosted device is noted during electromagnetic tests.

FIG. 6 refers to the right side view of the device 12 that shows the phones connector 35

FIG. 7 refers to the mounting bracket alone, showing the interlocking pin 23 that locks with the aforementioned mounting clip 21.

FIG. 8 refers to the iPhone cradle 1 showing the hosted device's connector hole 27, the detaching hole 28 useful to push out the iPhone from the cradle. The Apple iPhone power button needs a cavity in place 24. The iPhone side buttons need a gap 25 cut out to the side of the cradle so they are accessible. Two small pieces protrude from the internal sides 26 in order to lock the iPhone within the cradle 1, in regards of this the material have to be chosen appropriately for allowing a slight bending of the internal walls when inserting the phone in its cradle 1. The preferred embodiment would be a material of a soft high-molecular compound. A separation in the walls has been introduced 29 to allow the aforementioned bending without compromising the structure of the cradle.

FIG. 9a and FIG. 9b refers to an example of Apple iPad cradle 33 that includes a pocket 34 useful to push out the mounting bracket 3b through the hole 31, a hole for the hosted device's connector 30 and a socket for the interlocking magnet 32. The iPad cradle example allows the iPad device to be inserted longitudinally so it is held in place by the hosted device's connector once the cradle 33 is connected to the body of the drum unit 12.

To be noted, the cradles shown in this document are only to be taken as examples as every hosted device needs an individual cradle built in one of the two preferred
embodiments: for smaller devices, as iPod or iPhone the method is as shown in the example referred to the cradle 1, for larger devices, such as iPad or iPad Mini, the method of insertion, and subsequently the shape of the cradle is preferred as in the cradle 33.

FIG. 10 refers to the accessory block schematics diagram, showing how the electronics works.

Starting from the analog signal coming from a pad, that signal gets electrically adapted by resistors and Zener diodes in order to make it suitable for the ADC (Analog to Digital Converter) in terms of maximum and minimum electric value. Once the electric signal has been transformed into a numeric value, thanks to the internal ADC, the microprocessor acquires it, makes calculations, and eventually creates a midi packet to send to the iOS device through the USB port.

The hosted device, received the MIDI packets at a reasonable latency, make the MIDI information available for the software to be reproduced as a sound or treated as is for any purpose in the field.
1) An electronic drum module comprising:
   i. a body that comprises a support for connecting a cradle, wherein said cradle is configured to hold a mobile device;
   ii. at least a trigger input arranged on said body;
   iii. at least an audio output arranged on said body;
   iv. at least an audio input arranged on said body;
   v. at least a percussive source connected to said trigger input by a trigger cable;
   vi. a microprocessor within said body adapted to receive in input a trigger signal from said percussive source, elaborate said trigger signal in order to generate a corresponding output signal and transmit said output signal to said mobile device corresponding to a percussive source that generate a trigger signal, such that said output signal allow to reproduce corresponding sounds of said percussive source on said mobile device.

2) Electronic drum module according to claim 1, wherein said percussive source comprise at least a drum pads and/or at least an electronic cymbal.

3) Electronic drum module according to any of the claims 1-2, wherein said body comprises a plurality of trigger inputs for connecting respective percussive sources.

4) Electronic drum module according to any of the claims 1-3, wherein said percussive source comprises triggers mounted on an acoustic percussive instrument.

5) Electronic drum module according to any of the claims 1-4, wherein said output signal is transmitted via a wired connection.

6) Electronic drum module according to any of the claims 1-4, wherein said output signal is transmitted through a wired universal serial bus connection.

7) Electronic drum module according to any of the claims 1-6, wherein said trigger inputs are configured as 3.5mm jack audio style connectors.

8) Electronic drum module according to any of the claims 1-7, wherein two input sources are configured to receive signal from microphones.

9) Electronic drum module according to any of the claims 1-8, wherein two input sources are configured to receive audio signal from an auxiliary source.

10) Electronic drum module according to any of the claims 1-9, wherein a combination of magnets are used to interlock said body and said cradle.

11) Electronic drum module according to any of the claims 1-10, wherein rails on the contacting surfaces allow for a smoother interlocking of body and cradle.
12) Electronic drum module according to any of the claims 1-10, wherein said mobile device is selected among an iPhone, iPad or iPod.

13) Electronic drum module according to any of the claims 1-12, wherein a memory unit is associated to said microprocessor.
Application No: GB1221663.6
Examiner: Rhiannon Jenkins
Claims searched: 1-7, 10 & 12
Date of search: 5 September 2013

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

<table>
<thead>
<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1-7, 10 &amp; 12</td>
<td>US 2012/204704 A1 (ALESIS L P) - See the entire document</td>
</tr>
<tr>
<td>X</td>
<td>1-7, 10 &amp; 12</td>
<td>US 2012/144977 A1 (NUMARK IND LP) - See the figures and paragraphs [0031] to [0041]</td>
</tr>
<tr>
<td>X</td>
<td>1-7, 10 &amp; 12</td>
<td>EP 2528056 A2 (ALESIS L P) - See the figures and paragraphs [0010] to [0030]</td>
</tr>
<tr>
<td>X</td>
<td>1-6 &amp; 12</td>
<td>US 2010/016079 A1 (SONY COMP ENTERTAINMENT US) - See the figures and paragraphs [0012] to [0121]</td>
</tr>
<tr>
<td>X</td>
<td>1-6 &amp; 12</td>
<td>US 2010/064883 A1 (GYNES D) - See the figures and paragraphs [0033] to [0066]</td>
</tr>
<tr>
<td>X</td>
<td>1-7, 10 &amp; 12</td>
<td>US 2011/004328 A1 (NUMARK IND LP) - See figures 5 to 8 and paragraphs [0005] to [0057]</td>
</tr>
</tbody>
</table>

Categories:

| X  | Document indicating lack of novelty or inventive step |
| Y  | Document indicating lack of inventive step if combined with one or more other documents of same category. |
|   & | Member of the same patent family |
| A  | Document indicating technological background and/or state of the art. |
| P  | Document published on or after the declared priority date but before the filing date of this invention. |
| E  | Patent document published on or after, but with priority date earlier than, the filing date of this application. |

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

G10D; G10H

The following online and other databases have been used in the preparation of this search report:

EPODOC, WPI, INTERNET
### International Classification:

<table>
<thead>
<tr>
<th>Subclass</th>
<th>Subgroup</th>
<th>Valid From</th>
</tr>
</thead>
<tbody>
<tr>
<td>G10H</td>
<td>0001/32</td>
<td>01/01/2006</td>
</tr>
<tr>
<td>G10D</td>
<td>0013/02</td>
<td>01/01/2006</td>
</tr>
<tr>
<td>G10H</td>
<td>0001/00</td>
<td>01/01/2006</td>
</tr>
<tr>
<td>G10H</td>
<td>0007/00</td>
<td>01/01/2006</td>
</tr>
</tbody>
</table>