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(54) **THERMOMETER-EQUIPPED PACIFIER CAPABLE OF SELF-CHARGING USING PIEZOELECTRIC ELEMENT**

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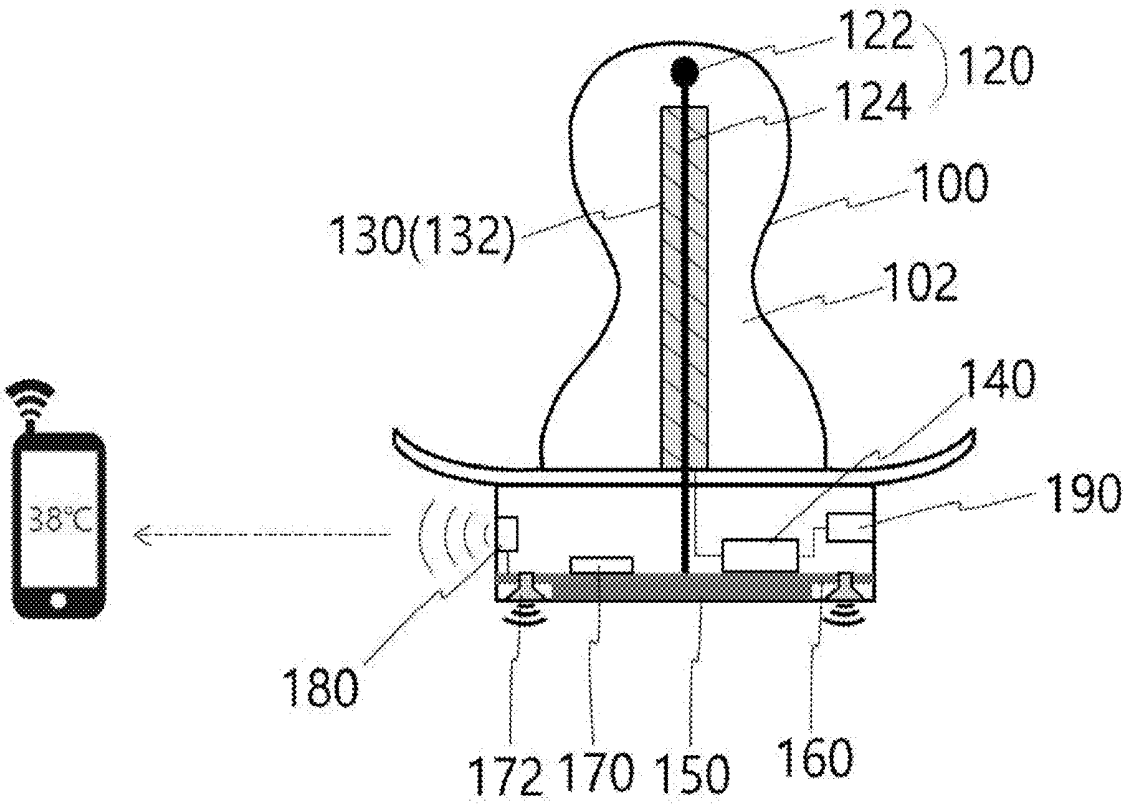
(57) **ABSTRACT**

Disclosed herein is a thermometer-equipped pacifier capable of self-charging using a piezoelectric element. The pacifier includes a nipple part, a case, a temperature sensor unit, a piezoelectric element unit, a charging unit, a display unit, and a control unit. The nipple part is made of a flexible elastic material, and has an internal space. The case is coupled to the lower portion of the nipple part. The temperature sensor unit is disposed inside the nipple part, and detects body temperature. The piezoelectric element unit is disposed inside the nipple part, and generates electricity in response to external pressure. The charging unit is contained in the case, and charges and stores the electricity. The display unit is attached onto the case, and displays the body temperature. The control unit is contained in the case, and performs control so that power can operate the temperature sensor unit and the display unit.



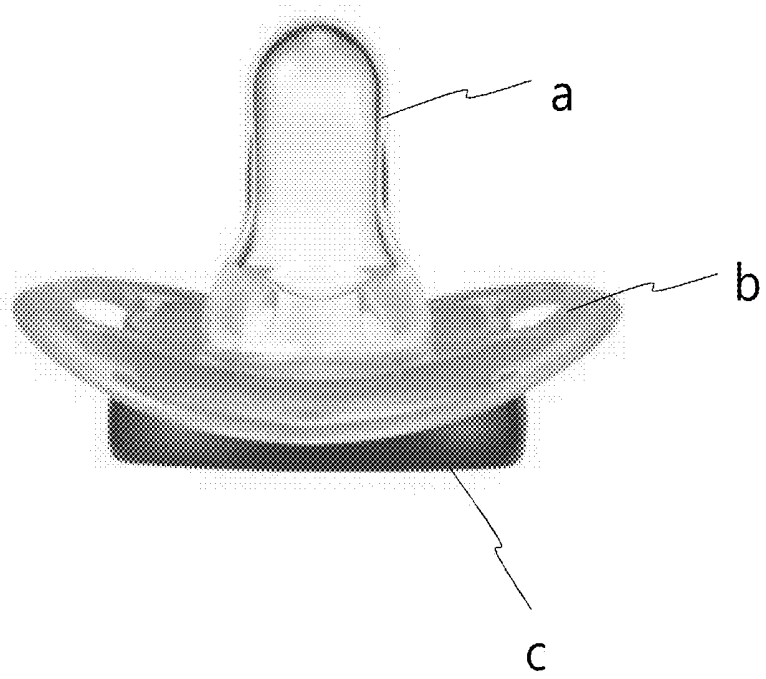


FIG. 1

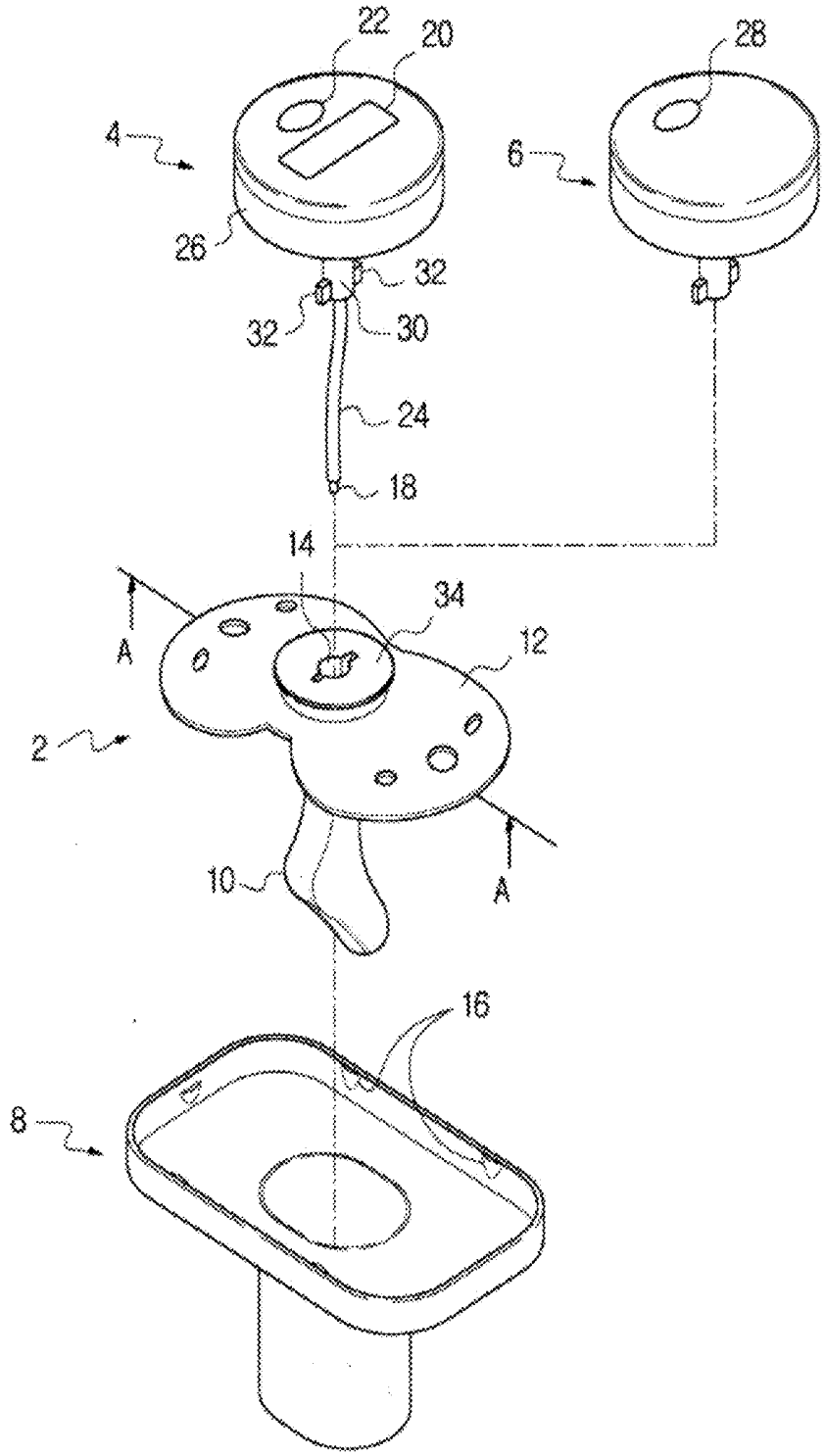


FIG. 2

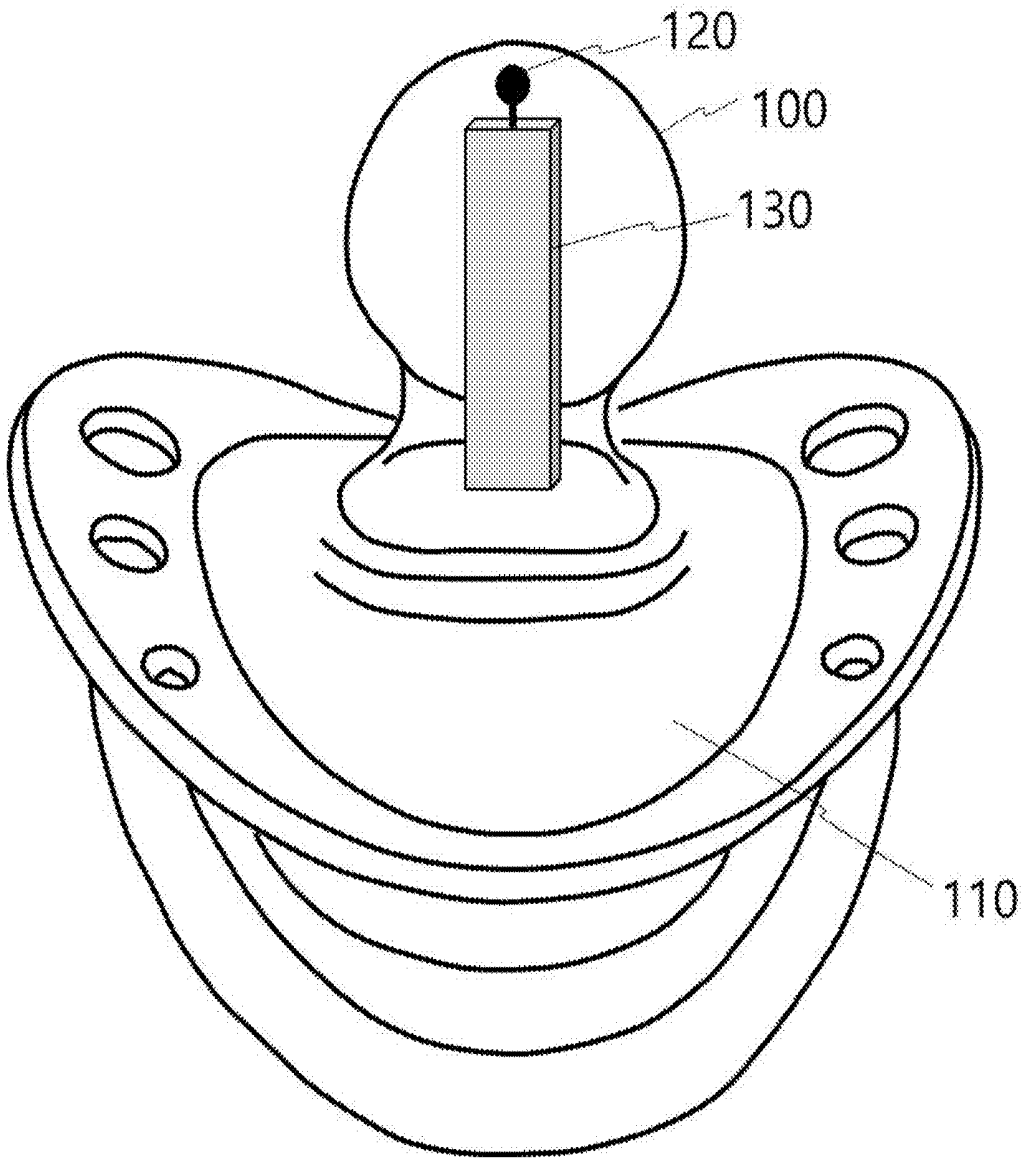


FIG. 3

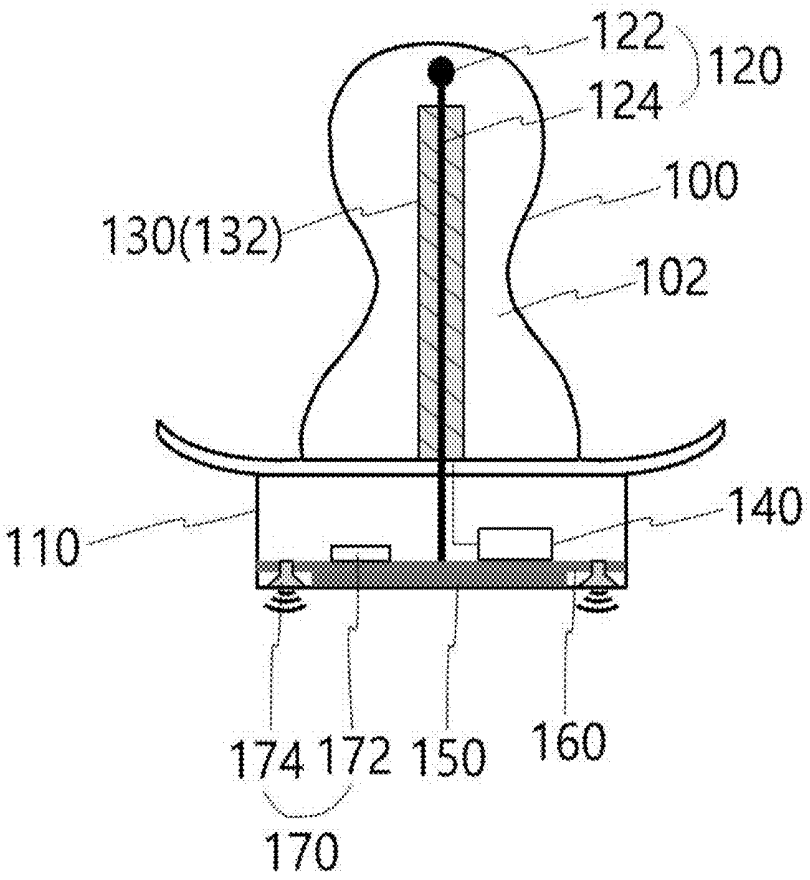


FIG. 4

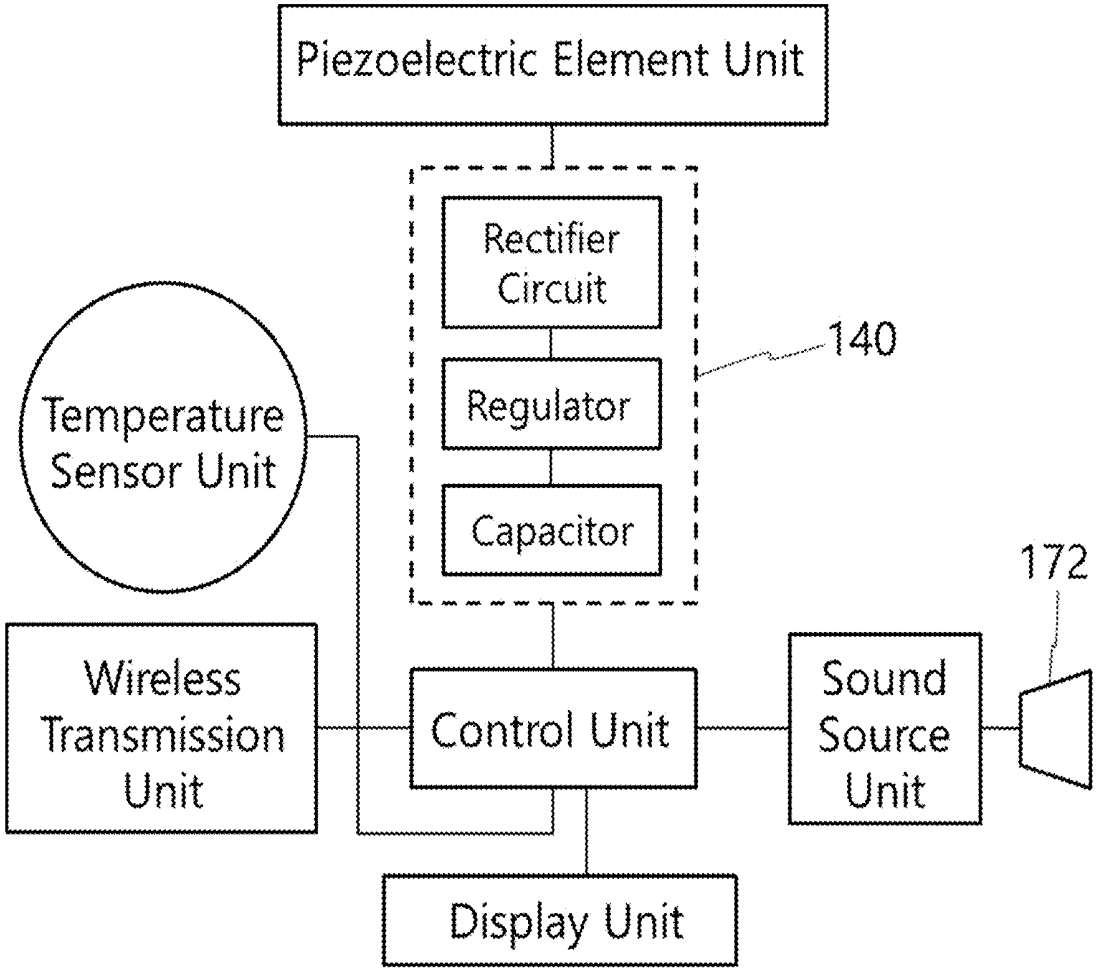

Piezoelectric Element Unit
Rectifier Circuit
Regulator
Capacitor
140
Temperature Sensor Unit
172
Wireless Transmission Unit
Control Unit
Sound Source Unit
Display Unit

FIG. 5

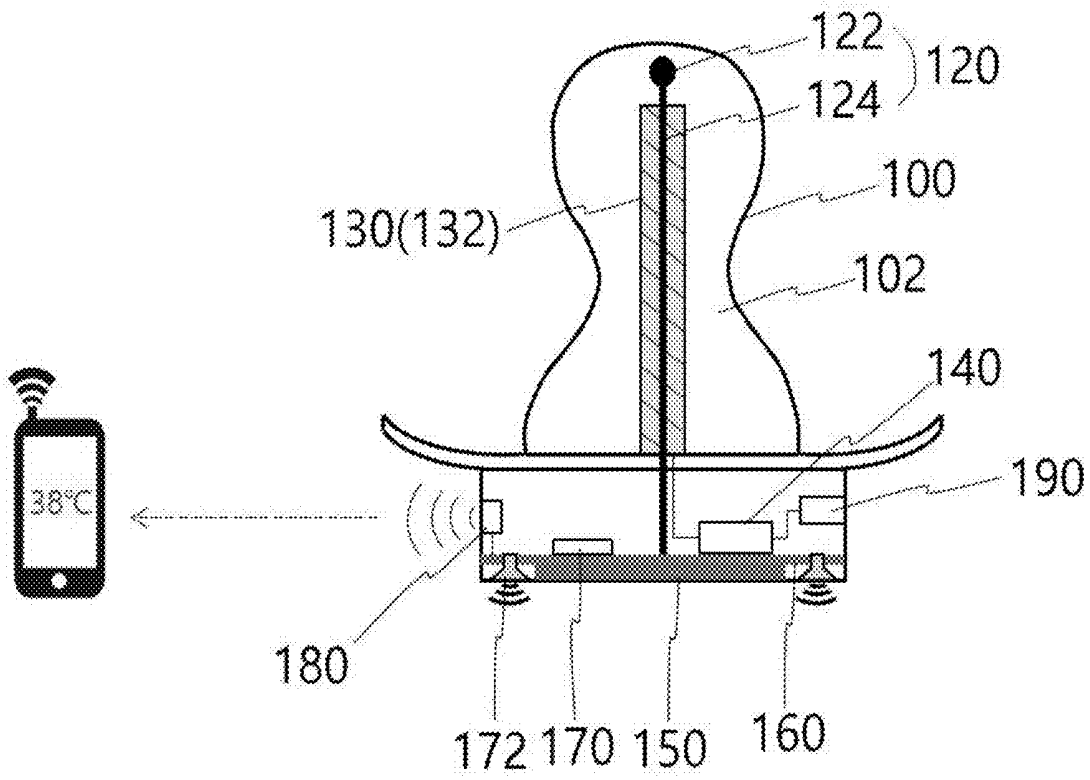


FIG. 6

THERMOMETER-EQUIPPED PACIFIER CAPABLE OF SELF-CHARGING USING PIEZOELECTRIC ELEMENT

BACKGROUND

1. Technical Field

[0001] The present invention relates generally to a pacifier that an infant plays with as a toy or an infant uses to fall sleep, and more particularly to a thermometer-equipped pacifier capable of self-charging using a piezoelectric element, in which a digital thermometer is contained in a pacifier, and thus the body temperature of an infant can be checked as desired and the pacifier can perform self-charging.

2. Description of the Related Art

[0002] An infant product called a pacifier (American English), a dummy (United Kingdom, other Commonwealth countries and Ireland), a binky or soother (Canadian English), and a teether (Philippine English) is an essential item that is used by almost all infants.

[0003] FIG. **1** is a photo showing a typical pacifier.

[0004] In general, a pacifier includes a nipple-shaped nipple part "a" made of a transparent and elastic material so that an infant can have the nipple part "a" in his or her mouth and can bite or suck it, a guard plate "b" configured to prevent the pacifier from being fully inserted into the mouth, and a case "c," as shown in the photo.

[0005] Since there are many cases where infants always have such pacifiers in their mouths, inventions that are configured such that a temperature sensor is disposed in a pacifier and thus a the body temperature of an infant can be checked as desired have been proposed.

[0006] FIG. **2** is an exploded perspective view showing a conventional thermometer-equipped pacifier.

[0007] As shown in FIG. **2**, the conventional thermometer-equipped pacifier includes: a nipple-shaped nipple part **10** made of a flexible elastic material, and configured to have an internal space; a guard plate **12** securely combined with the lower end portion of the nipple part **10** to be integrated with the nipple part **10**, and configured to have a hole communicating with the space of the nipple part **10**; a digital thermometer **4** configured to be combinable with the guard plate **12** and to include a temperature sensing element **18** inserted deeply into the nipple part **10**; and a melody generator **6** configured to be combinable with the guard plate **12** and to issue one or more stored lullabies using an IC circuit.

[0008] The temperature sensor is inserted into the nipple part, and thus body temperature is indirectly measured and is displayed using a digital method, thereby providing the advantage of enabling an observer to be immediately aware of the body temperature of an infant. Furthermore, the conventional thermometer-equipped pacifier is configured to issue a melody, such as a lullaby, thereby providing the advantage of enabling an infant to easily fall asleep while having the pacifier in his or her mouth.

[0009] However, the conventional thermometer-equipped pacifier is inconvenient in that a battery must be replaced when the battery is discharged because a separate battery is contained in the pacifier and supplies power. The digital thermometer accelerates discharge speed because it is always in a turned on state. Furthermore, while a melody is being issued, the voltage consumed by the speaker is considerably high.

[0010] [Preceding Technical Documents]

[0011] [Patent Documents]

[0012] 1) Korean Utility Model Registration No. 20-0214472 published on Dec. 11, 2000 and entitled "Multipurpose Pacifier with Separable Thermometer"

[0013] 2) Japanese Utility Model Registration No. 3161231 published on Jul. 29, 2010 and entitled "Nipple Type Thermometer"

[0014] 3) U.S. Pat. No. 5,108,423 published on Apr. 28, 1992 and entitled "Nipple Assembly with Alarm Buzzer and Body Temperature Indicator"

SUMMARY

[0015] Accordingly, the present invention is intended to overcome the above-described problems of the conventional art, and an object of the present invention is to provide a thermometer-equipped pacifier capable of self-charging using a piezoelectric element, in which a piezoelectric element is provided inside a pacifier, and thus electricity is generated and charged by using external pressure generated when an infant bites or sucks the pacifier, with the result that the supply of external power is not required.

[0016] In order to achieve the above object, there is provided a thermometer-equipped pacifier capable of self-charging using a piezoelectric element, including: a nipple-shaped nipple part made of a flexible elastic material, and configured to have an internal space; a case coupled to the lower portion of the nipple part; a temperature sensor unit disposed inside the nipple part, and configured to detect body temperature in the mouth of an infant; a piezoelectric element unit disposed inside the nipple part, and configured to generate electricity through deformation thereof attributable to external pressure; a charging unit contained in the case, and configured to charge and store the electricity generated by the piezoelectric element unit; a display unit attached onto the outside of the case, and configured to display the temperature detected by the temperature sensor unit; and a control unit contained in the case in a circuit board form, and configured to perform control so that power supplied by the charging unit can operate the temperature sensor unit and the display unit.

[0017] The nipple part may be filled with an elastic filler material so that the external pressure can be directly transferred to the piezoelectric element.

[0018] The case may further contain a sound source unit configured to store and play back source sounds and a speaker configured to output the source sounds played back by the sound source unit, and the control unit may perform control so that power can be supplied to the sound source unit and the speaker.

[0019] The case may further contain a wireless transmission unit configured to receive the body temperature of the infant from the control unit and transmit body temperature data to an external mobile device, and the control unit may perform control so that power can be supplied to the wireless transmission unit.

[0020] The case may further contain a charging socket connected to the charging unit and configured to enable charging through connection with an external power source.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0022] FIG. **1** is a photo showing a typical pacifier;

[0023] FIG. **2** is an exploded perspective view showing a conventional thermometer-equipped pacifier;

[0024] FIG. **3** is a perspective view showing the overall appearance of a thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to an embodiment of the present invention;

[0025] FIG. **4** is a sectional view of the thermometer-equipped pacifier shown in FIG. **3**;

[0026] FIG. **5** is a diagram showing the overall circuit configuration of a thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to the present invention; and

[0027] FIG. **6** is a sectional view showing a thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to another embodiment of the present invention.

DETAILED DESCRIPTION

[0028] Although the present invention will be described in conjunction with embodiments of the present invention and with reference to the accompanying drawings, the embodiments of the present invention are intended to help to easily understand the present invention and the scope of the present invention is not limited to the embodiments of the present invention.

[0029] In the following description, when it is determined that detailed descriptions of known components or functions may unnecessarily make the gist of the present invention obscure, they will be omitted.

[0030] FIG. **3** is a perspective view showing the overall appearance of a thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to an embodiment of the present invention, FIG. **4** is a sectional view of the thermometer-equipped pacifier shown in FIG. **3**, and FIG. **5** is a diagram showing the overall circuit configuration of a thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to the present invention.

[0031] Referring to FIGS. **3** to **5**, a thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to the present invention may be configured to include a nipple part **100**, a case **110**, a temperature sensor unit **120**, a piezoelectric element unit **130**, a charging unit **140**, a display unit **150**, and a control unit **160**.

[0032] First, the nipple part **100** is made of flexible elastic material, and has an internal space. Although it is generally preferred that the nipple part **100** has a nipple shape so that an infant can have the nipple part **100** in his or her mouth, the shape of the nipple part **100** is not limited to any specific shape.

[0033] The nipple part **100** may be made of a well-known material, such as elastic rubber, silicone, or synthetic resin harmless to human bodies.

[0034] Furthermore, a transparent material, an opaque material, or a translucent material may be used.

[0035] Next, the case **110** is combined with the nipple part **100**. The case **110** has an internal space, and may accommodate the charging unit **140**, the display unit **150**, and the control unit **160** therein.

[0036] The case **110** is generally made of a plastic material. Although not shown in the drawings, a hole that communicates with the nipple part **100** is formed through the top of the case **110**. Through this hole, the temperature sensor unit **120** and the piezoelectric element unit **130** accommodated in the nipple part **100** are electrically connected to the control unit **160** disposed in the case **110**.

[0037] Next, the temperature sensor unit **120** is disposed to be accommodated inside the nipple part **100**. The temperature sensor unit **120** functions to detect the body temperature of an infant.

[0038] The temperature sensor unit **120** may be a well-known digital temperature sensor, and may be of a contact type. The contact type sensor may detect temperature when contact with the nipple part **100** is maintained. Since an infant has the nipple part **100** in his or her mouth continuously, sufficient time required for the temperature sensor unit **120** to detect body temperature is ensured.

[0039] Meanwhile, a variety of non-contact type temperature sensors recently commercialized may be used. The non-contact type sensors can detect temperature without contact, and thus can accurately detect temperature.

[0040] Meanwhile, the temperature sensor unit **120** measures body temperature, and thus a wide temperature measurement range is not required.

[0041] In the temperature sensor unit **120**, a temperature sensor **122** is disposed to be contained in the upper end portion of the nipple part **100** in order to desirably detect temperature. An electric wire **124** configured to transfer signals may be extended and connected to the inside of the case **110**.

[0042] Next, the piezoelectric element unit **130** that corresponds to a core technical feature of the present invention will be described.

[0043] The piezoelectric element unit **130** includes a piezoelectric element configured to generate electricity in response to external pressure, and is also disposed inside the nipple part **100**. The reason for this is to enable the external pressure, generated when an infant bites or sucks the nipple part **100**, to be directly transferred to the piezoelectric element **132**.

[0044] The external pressure that is transferred to the piezoelectric element **132** may include various types of force, such as compressive force, bending force, twisting force, etc. Accordingly, the piezoelectric element **132** may be perpendicularly disposed, as in the temperature sensor unit **120** shown in the drawings. The piezoelectric element **132** may be contained in the nipple part **100** in the form in which the piezoelectric element **132** is combined with the electric wire **124** of the temperature sensor unit **120**. However, this disposition is merely an example. Another type of disposition that enables external pressure to be desirably transferred may be employed.

[0045] Furthermore, the piezoelectric element unit **130** may be of a flexible type, and may have various shapes, such as a rod shape, a plate shape, etc. Accordingly, a piezoelectric polymer element, such as a polyvinylidene fluoride (PVDF) element, may be used.

[0046] In this case, although the nipple part **100** may have an empty space therein, the nipple part **100** may be config-

ured to be filled with an elastic filler material **102** so that there is no empty space therein, with the result that the external pressure can be directly transferred to the piezoelectric element **132**. Furthermore, the filler material functions to allow heat transfer to be more effectively performed when the above-described contact type temperature sensor is contained, thereby enabling the effective detection of body temperature.

[0047] In this case, the filler material **102** may be identical or similar to the material of the nipple part **100**. That is, the filler material **102** may be silicone, rubber, or the like.

[0048] Next, the charging unit **140** is disposed inside the case **110**, and is configured to receive, charge and store the electrical energy generated by the piezoelectric element unit **130**.

[0049] As shown in FIG. **5**, the charging unit **140** may include a rectifier circuit, a regulator, and a capacitor.

[0050] The rectifier circuit rectifies AC current generated by the piezoelectric element unit **130**. The DC current obtained through the rectification is regulated by the regulator to have a predetermined voltage. Thereafter, the regulated DC current is transferred to the capacitor, and may be subjected to charging.

[0051] In this case, the rectifier circuit may have an arrangement in which four diodes are arranged in a bridge form, and the regulator may include a converter to convert voltage.

[0052] Next, the display unit **150** is configured to display the temperature, detected by the temperature sensor unit **120**, on a screen so that the temperature can be recognized from the outside.

[0053] The display unit **150** is attached onto the outside of the case **110**, and may employ a general LCD digital screen connected to the control unit **160** to be described later.

[0054] Next, the control unit **160** is disposed inside the case **110** in the form of a printed circuit board (PCB). The control unit **160** is connected to the temperature sensor unit **120**, the piezoelectric element unit **130**, the charging unit **140**, and the display unit **150**, and controls them.

[0055] The control unit **160** receives the detected temperature from the temperature sensor unit **120** in an electrical form, processes and converts the received temperature data, and displays the processed and converted temperature data via the display unit **150** in a numerical form. Furthermore, the control unit **160** performs control so that the electricity generated by the piezoelectric element unit **130** can be charged into the charging unit **140**, and also performs control so that the charged power can be continuously supplied to the temperature sensor unit **120** and the display unit **150**.

[0056] FIG. **6** is a sectional view showing a thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to another embodiment of the present invention. The thermometer-equipped pacifier capable of self-charging using a piezoelectric element according to the other embodiment of the present invention will be described with reference to FIG. **6**.

[0057] According to the present embodiment of the present invention, a sound source unit **170** configured to store and play back source sounds in order to play back melodies to an infant is disposed inside a case **110**.

[0058] The sound source unit **170** may include memory configured to store source sounds, and a playback circuit configured to play back the source sounds stored in the memory.

[0059] Furthermore, a speaker **172** may be further included in order to output the source sounds, played back by the sound source unit **170**, to the outside. The speaker **172** may be disposed on the outside of the case **110**, as shown in FIG. **6**. A pair of speakers **172** may be provided on both sides of the display unit **150**.

[0060] In this case, the control unit **160** performs control so that power can be supplied from a charging unit **140** to the memory and the playback circuit, and also performs control so that music is output from the sound source unit **170** via the speaker **172**. It will be apparent that a switch configured to selectively turn on and off the power of the speaker **172** and a volume control may be further included.

[0061] Alternatively, in the present embodiment of the present invention, a wireless transmission unit **180** may be further included in the case **110**, may receive the body temperature of an infant from a control unit **160**, and may transmit the received body temperature to an external mobile device.

[0062] That is, as shown in FIG. **6**, the wireless transmission unit **180** connected to the control unit **160** receives power, and the temperature data measured by the temperature sensor unit **120** is displayed via a display unit **150** and, simultaneously, transmitted to the outside via the wireless transmission unit **180** continuously or regularly.

[0063] The transmission to a mobile device may be performed using wireless communication methods, such as LTE, Bluetooth, WiFi and ZigBee methods, etc., and thus the wireless transmission unit **180** may employ a device, such as a Bluetooth module, a WiFi module, a ZigBee module, etc. Since these communication methods correspond to well-known technologies, detailed descriptions thereof are omitted.

[0064] Accordingly, a parent can check and deal with the body temperature of an infant, transmitted by the wireless transmission unit **180**, via a mobile device as desired. A configuration may be made such that an alarm is issued when the body temperature of an infant is equal to or higher than a predetermined threshold body temperature.

[0065] Additionally, in an embodiment of the present invention, a separate charging socket **190** may be further included in order to prepare for a case where power is fully discharged from the capacitor of the charging unit **140**.

[0066] The charging socket **190** is disposed inside the case **110**, and is configured to perform charging through internal connection with the battery and external connection with an external power source.

[0067] The operation of the present invention will be described below.

[0068] Since an infant has the nipple part **100** in his or her mouth and bites or sucks the nipple part **100**, the nipple part **100** is exposed to various types of external pressure, such as compressive pressure, bending pressure, and twisting pressure.

[0069] As a result, the piezoelectric element unit **130** disposed inside the nipple part **100** is compressed, bent or twisted by external pressure, electricity is generated, and the generated electricity is charged into the capacitor through the rectifier circuit and the regulator in a current form.

[0070] The control unit **160** performs control so that the power charged into the charging unit **140** can be supplied to the temperature sensor unit **120**, the display unit **150**, the sound source unit **170**, the speaker **172**, and the wireless transmission unit **180**, and also performs control so that the

body temperature detected by the temperature sensor unit **120** can be converted into digital data and displayed on the display unit **150**.

[0071] Furthermore, the source sounds stored in the sound source unit **170** are played back using various methods and output to the outside via the speaker **172**, thereby helping an infant sleep deeply.

[0072] Moreover, the wireless transmission unit **180** transmits the body temperature data of an infant to an external mobile device, thereby helping a parent check the body temperature of the infant as desired.

[0073] According to the above-described present invention, the nipple part of the pacifier that is used as a toy by an infant is held in his or her mouth and is continuously subjected to external pressure, and thus self-charging is performed by the piezoelectric element, with the result that the pacifier can be semi-permanently used as a thermometer.

[0074] Furthermore, an infant can sleep deeply by means of the sound source unit, and a parent can check and deal with the body temperature of an infant via a mobile device at a remote location by means of the wireless transmission unit.

[0075] Although the present invention has been described in conjunction with the specific embodiments of the present invention and with reference to the accompanying drawings, it will be apparent to those having ordinary knowledge in the art to which the present invention pertains that various modifications and alterations can be made within the scope of the present invention based on the above detailed description.

What is claimed is:

1. A thermometer-equipped pacifier capable of self-charging using a piezoelectric element, comprising:

a nipple-shaped nipple part made of a flexible elastic material, and configured to have an internal space;

a case coupled to a lower portion of the nipple part;

a temperature sensor unit disposed inside the nipple part, and configured to detect body temperature in a mouth of an infant;

a piezoelectric element unit disposed inside the nipple part, and configured to generate electricity through deformation thereof attributable to external pressure;

a charging unit contained in the case, and configured to charge and store the electricity generated by the piezoelectric element unit;

a display unit attached onto an outside of the case, and configured to display the temperature detected by the temperature sensor unit; and

a control unit contained in the case in a circuit board form, and configured to perform control so that power supplied by the charging unit can operate the temperature sensor unit and the display unit.

2. The thermometer-equipped pacifier of claim **1**, wherein the nipple part is filled with an elastic filler material so that the external pressure can be directly transferred to the piezoelectric element.

3. The thermometer-equipped pacifier of claim **1**, wherein the case further contains a sound source unit configured to store and play back source sounds and a speaker configured to output the source sounds played back by the sound source unit, and the control unit performs control so that power can be supplied to the sound source unit and the speaker.

4. The thermometer-equipped pacifier of claim **1**, wherein the case further contains a wireless transmission unit configured to receive the body temperature of the infant from the control unit and transmit body temperature data to an external mobile device, and the control unit performs control so that power can be supplied to the wireless transmission unit.

5. The thermometer-equipped pacifier of claim **1**, wherein the case further contains a charging socket connected to the charging unit and configured to enable charging through connection with an external power source.

* * * * *

专利名称(译)	配备温度计的奶嘴，能够使用压电元件自充电		
公开(公告)号	US20180078463A1	公开(公告)日	2018-03-22
申请号	US15/293621	申请日	2016-10-14
[标]申请(专利权)人(译)	工业技术研究所的学术合作发现yonam		
[标]发明人	JUNG DAESUNG		
发明人	JUNG, DAESUNG		
IPC分类号	A61J17/00 A61B5/01 A61B5/00 A61M21/02		
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优先权	1020160119211 2016-09-19 KR		
外部链接	Espacenet USPTO		

摘要(译)

本文公开了一种能够使用压电元件自充电的配有温度计的奶嘴。奶嘴包括奶嘴部分，壳体，温度传感器单元，压电元件单元，充电单元，显示单元和控制单元。乳头部分由柔性弹性材料制成，并具有内部空间。壳体连接到乳头部分的下部。温度传感器单元布置在奶嘴部分内部，并且检测体温。压电元件单元布置在接头部分的内部，并且响应于外部压力而发电。充电单元包含在机箱内，并对电力进行充电和存储。显示单元连接到外壳上，并显示体温。控制单元包含在壳体中，并且执行控制，使得电力可以操作温度传感器单元和显示单元。