US 20080178384A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2008/0178384 A1**

(43) **Pub. Date: Jul. 31, 2008**

Lord

(54) **HEARTBEAT SIMULATOR AND SLEEP AID INCORPORATING THE SAME**

(76) Inventor: **John Lord**, Denver, CO (US)

Correspondence Address:
Michael R. Henson & Associates, LLC
5613 DTC Parkway, Suite 240
Greenwood Village, CO 80111

(21) Appl. No.: **12/019,599**

(22) Filed: **Jan. 24, 2008**

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/013,382, filed on Jan. 11, 2008.

(60) Provisional application No. 60/897,740, filed on Jan. 24, 2007.

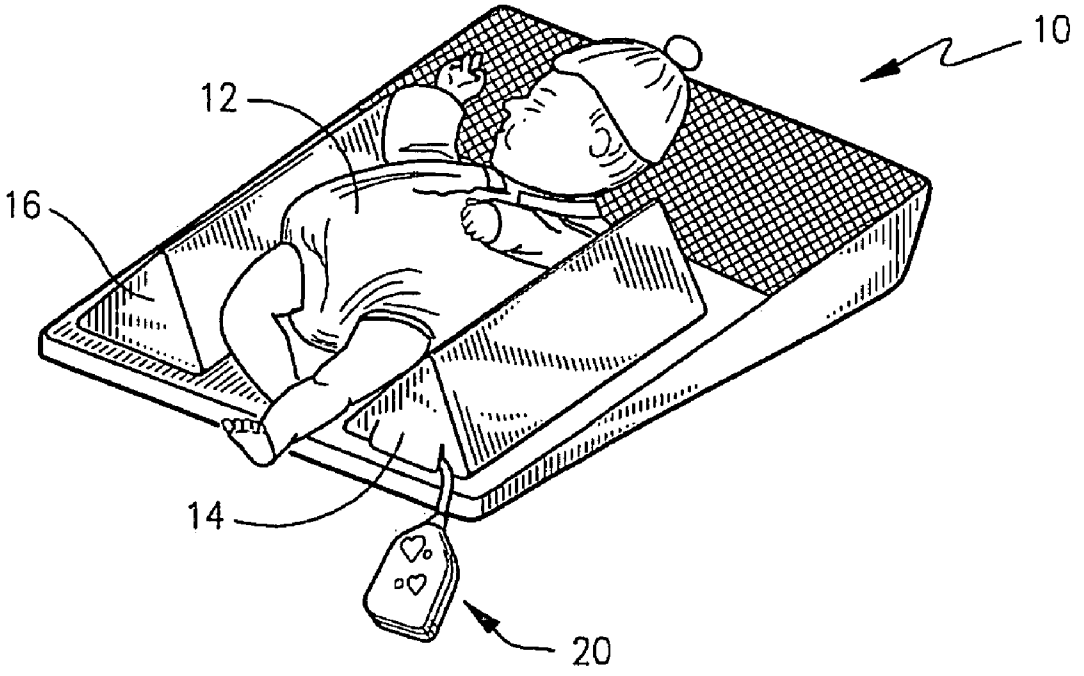
Publication Classification

(51) **Int. Cl.**
A47D 7/00 (2006.01)

(52) **U.S. Cl.** **5/93.1**

(57) **ABSTRACT**

Provided is a sleep aid including a sleep positioner having a selected configuration which is sized and adapted to accommodate an infant when placed in a reposed position on a top surface thereof. The positioner includes an internal resilient padding and an outer casing substantially enclosing the padding. A heartbeat simulator is at least partially embedded within the sleep positioner and is operative upon actuation to vibrate in a manner which simulates a mother's heartbeat.



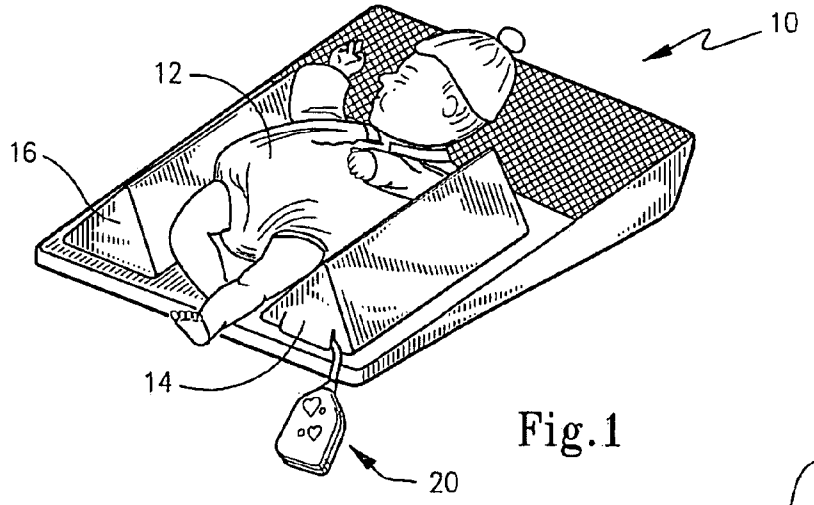


Fig.1

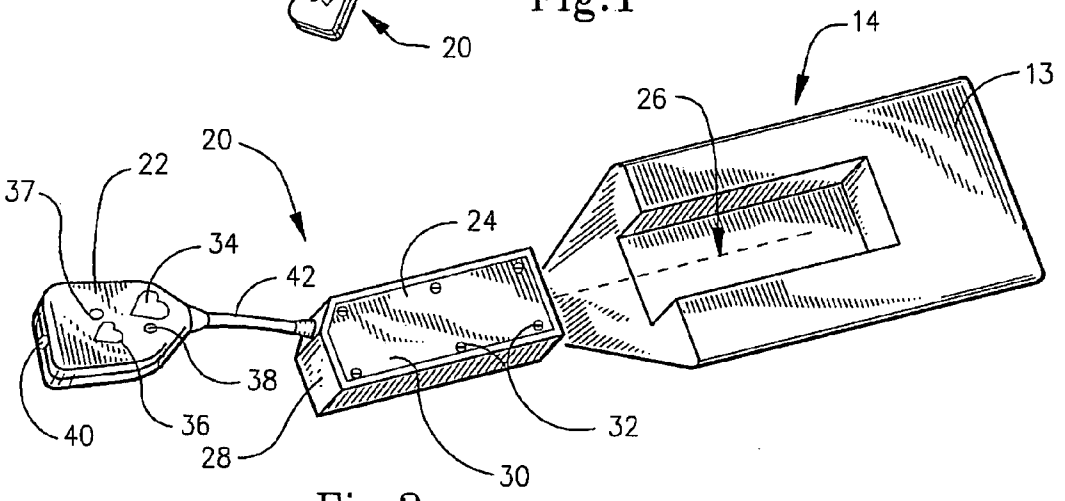


Fig.2

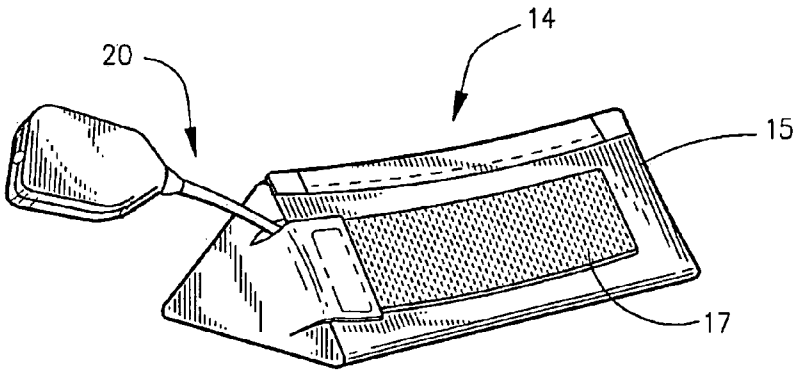


Fig.3

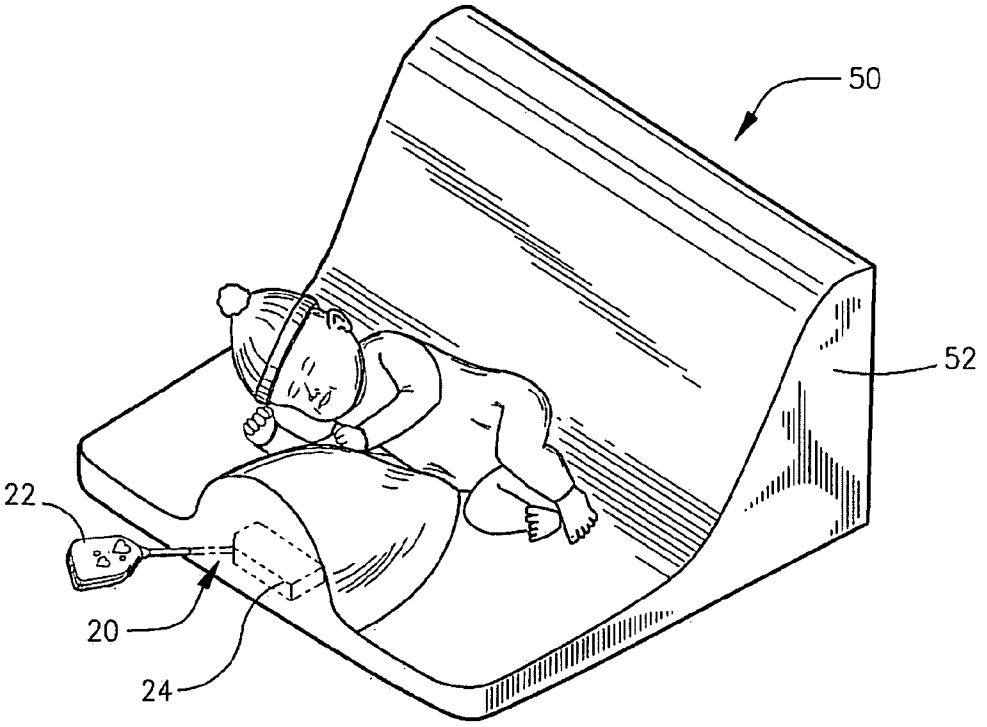


Fig.4

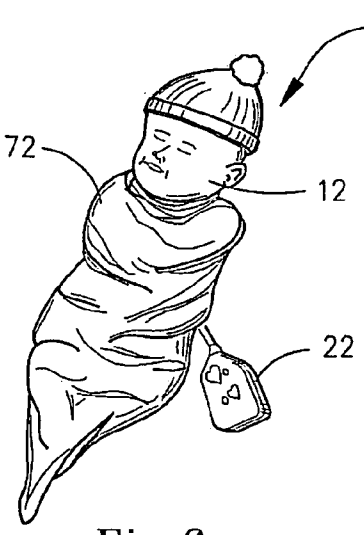


Fig.6

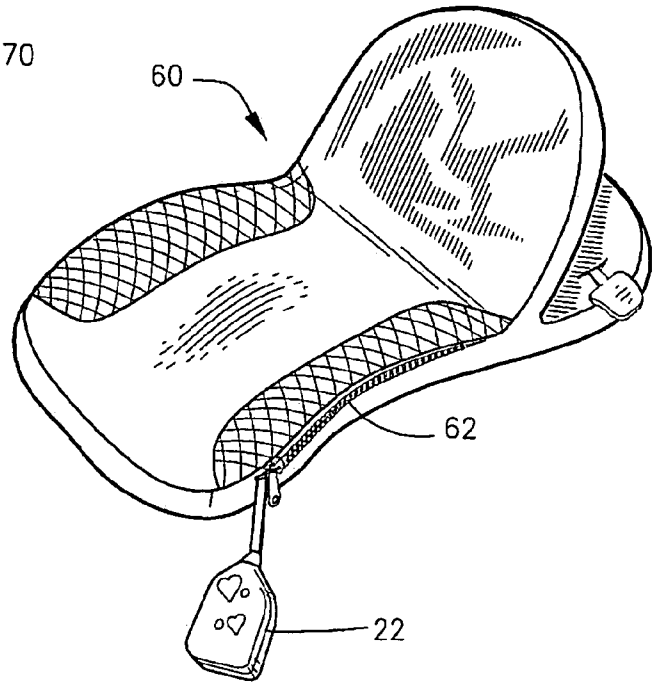


Fig.5

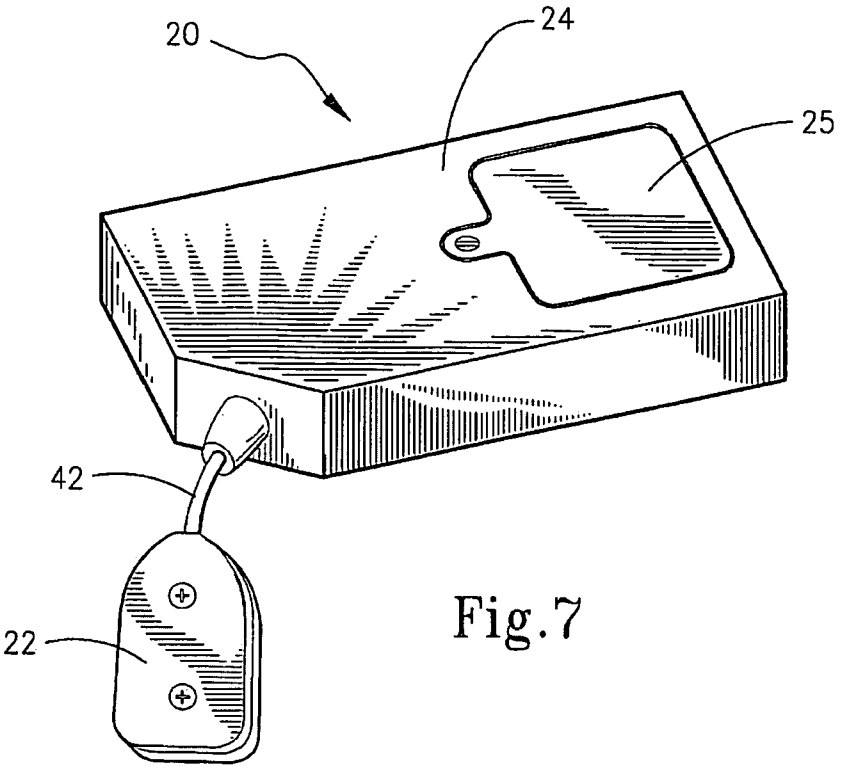


Fig.7

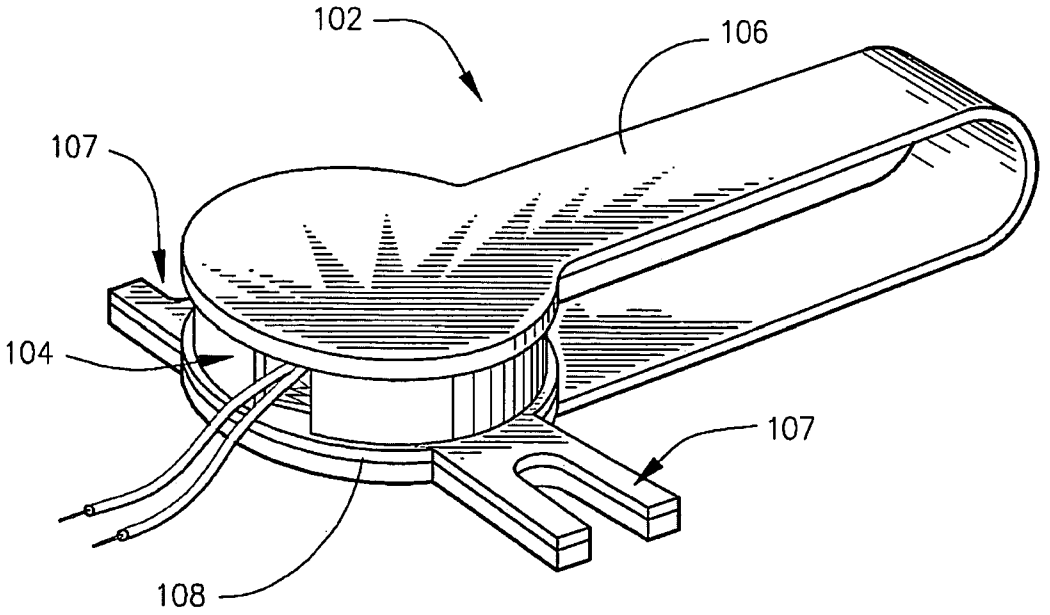


Fig.9

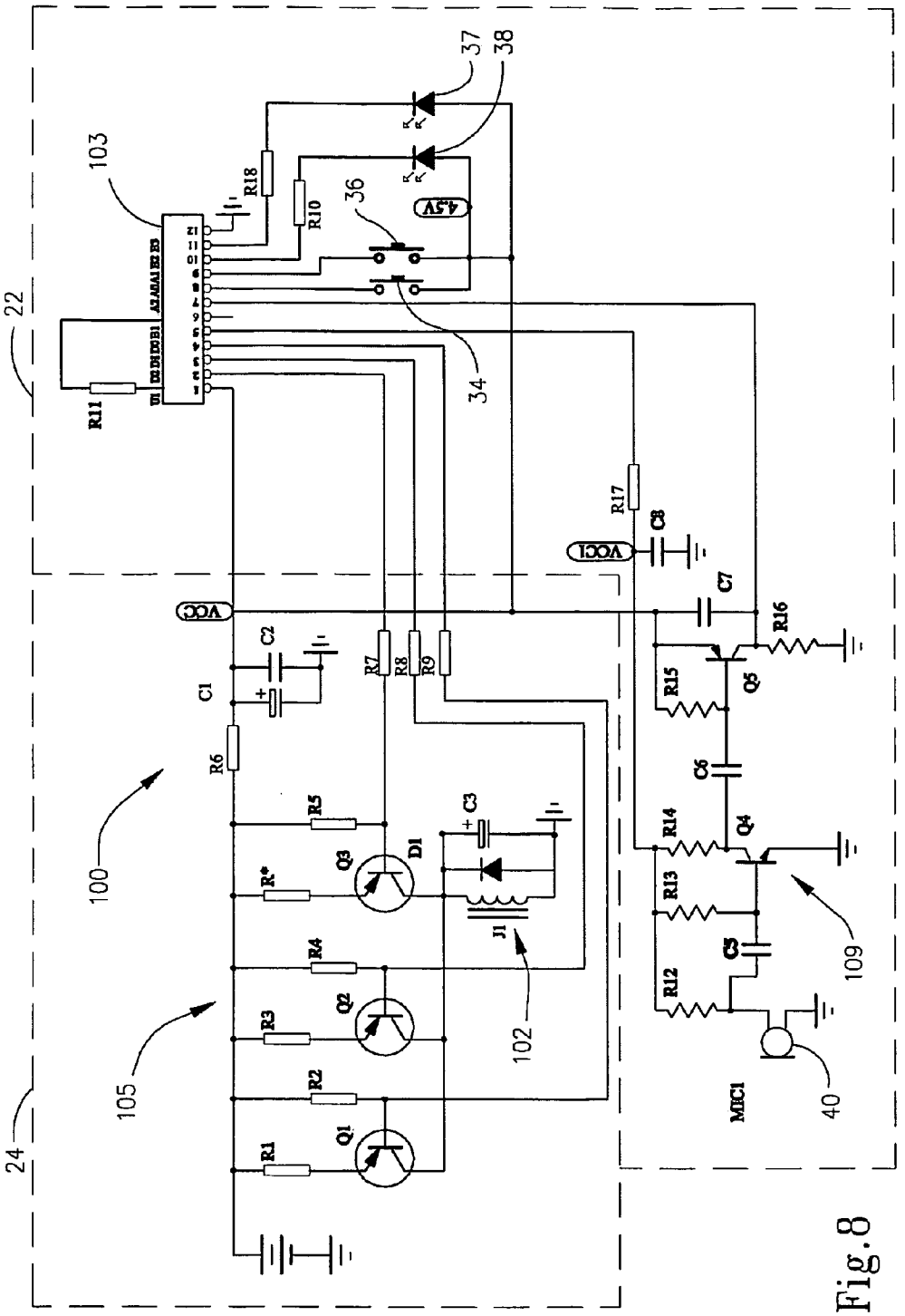

22
24
100
102
103
105
109
34
36
37
38
40
4.5V
VCC
VCC1
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
C1
C2
C3
C5
C6
C7
C8
Q1
Q2
Q3
Q4
Q5
D1
J1
MIC1

Fig.8

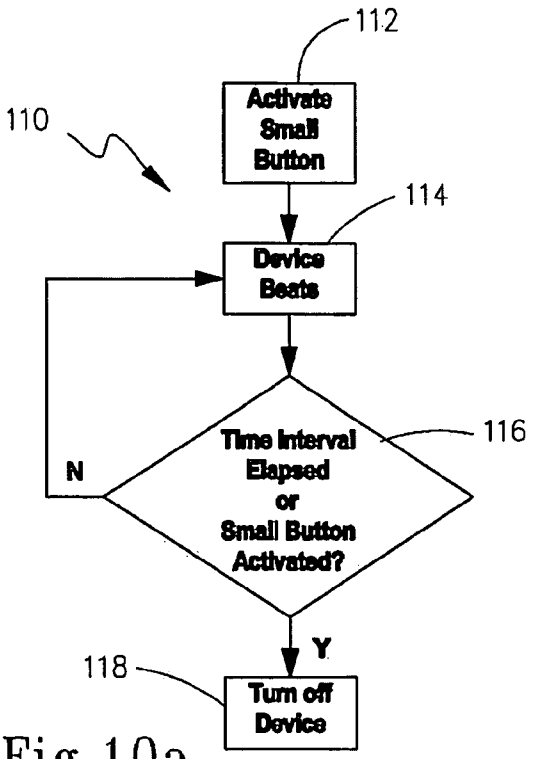


Fig.10a

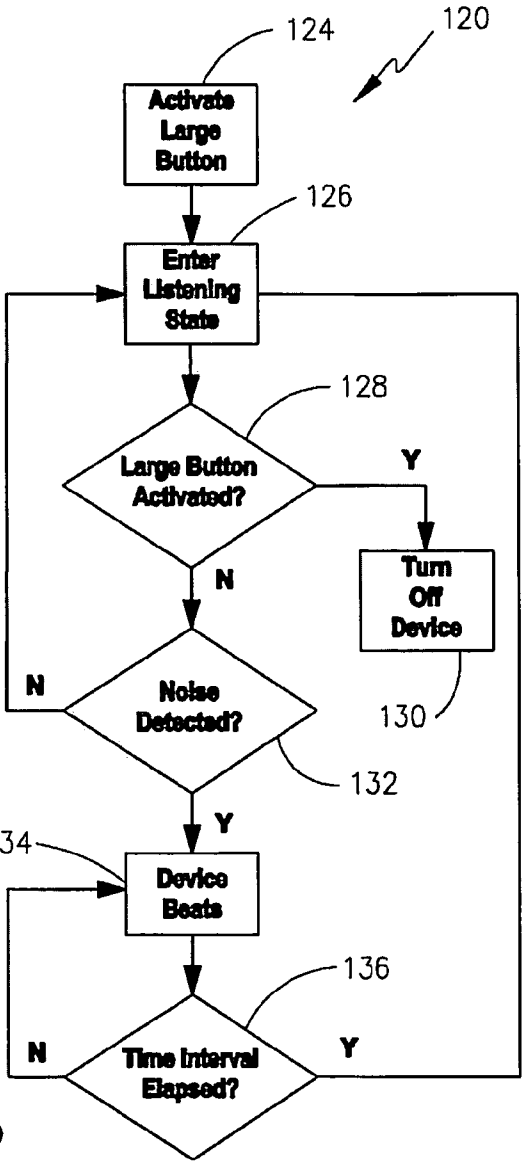


Fig.10b

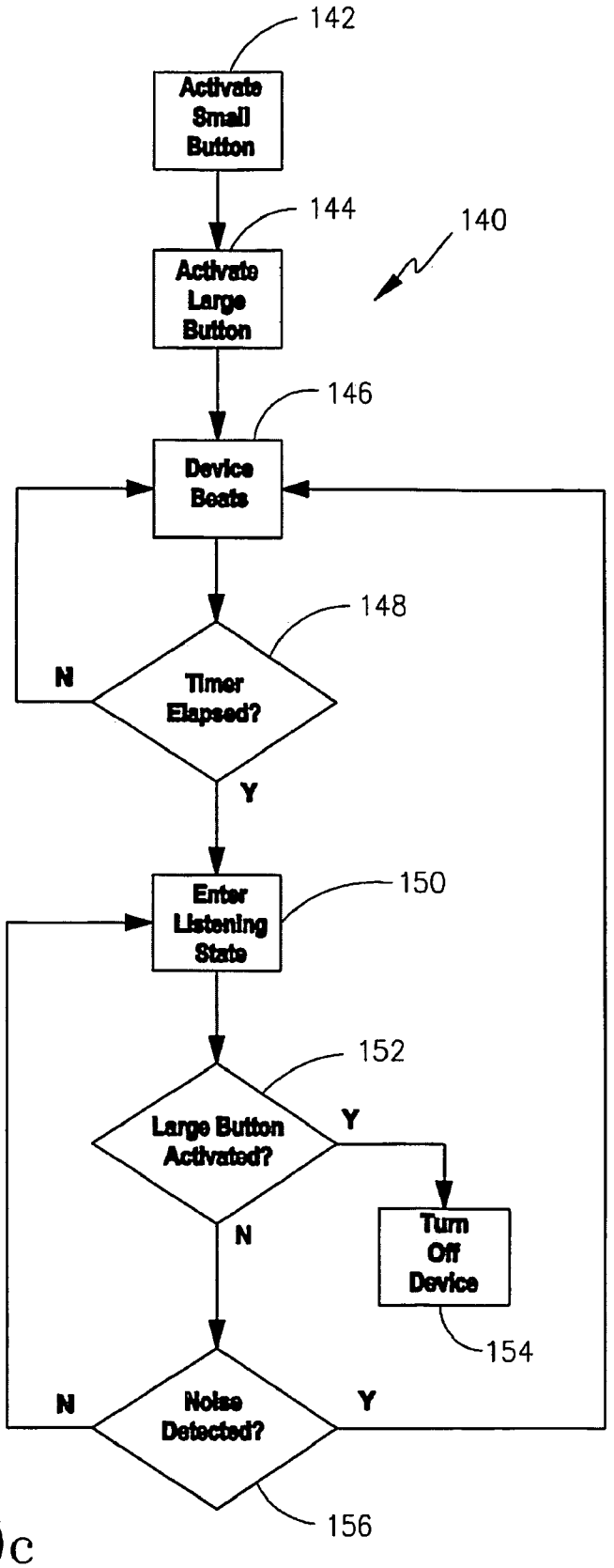

142
Activate Small Button
144
140
Activate Large Button
146
Device Beats
148
N
Timer Elapsed?
Y
150
Enter Listening State
152
Large Button Activated?
Y
N
Turn Off Device
154
N
Noise Detected?
Y
156

Fig.10c

HEARTBEAT SIMULATOR AND SLEEP AID INCORPORATING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation-in-part of U.S. nonprovisional application Ser. No. 12/013,382 filed on Jan. 11, 2008, which claims the benefit of U.S. provisional application Ser. No. 60/897,740 filed on Jan. 24, 2007, the disclosure of which is incorporated by reference in its entirety.

BACKGROUND

[0002] One of the strongest human instincts involves the care and nurturing of offspring. Parents provide for their children in a wide variety of ways. At a basic level, however, parents provide their children with the necessities of food, clothing, and shelter. While the needs of children last from birth through later years, the care and nurturing of newborns and young infants present special issues. As is well known, infants are somewhat helpless in interacting with their environment and rely upon others to assist and care for them.

[0003] One of the aspects of infant care is the provision of sleeping accommodations for the infant. A wide variety of beds, cradles and cribs are used as a resting place for the infant. Various cushions, pads and blankets may be employed to increase the comfort of the infant during the sleep activity. Moreover, numerous cushion devices, such as sleep positioners are sometimes used to create a better sleeping environment for a young child.

[0004] Despite these various devices and comfort items, some infants exhibit difficulty in entering the sleep state. It is known to provide audible relaxation aids for a child with these audible aids including singing to the child, recorded music, mechanical sound devices and the like. In particular, it is thought that simulating the sound of the human heart helps to relax an infant or young child. For instance, placing a ticking clock next to an infant was thought to relax the infant and assist the infants slumber. This was because the ticking of the clock at one second intervals is close to the rate of the human heart thereby providing a rudimentary simulation of the heartbeat. This ticking concept has evolved into more elaborate devices which simulate the human heart.

[0005] One such device, for example, is described in International Application PCT/AU90100100 International Publication No. W091/13647 entitled Sleep Inducing Device. Another such device is described in U.S. Pat. No. 5,063,912 to Hughes issued Nov. 12, 1991. While these devices are used to generate an audible tone, it is also known to provide sensory input to an infant in the form of a heartbeat vibration in order to calm the infant. One such device is shown in U.S. Pat. No. 3,419,923 issued Jan. 7, 1969 to Cowan. In U.S. Pat. No. 3,994,282 issued Nov. 30, 1976 to Moulet an astatic multivibrator is provided for producing audible sounds simulating the human heartbeat. U.S. Pat. No. 4,124,022 issued Nov. 7, 1978 to Gross also provides an audible tone as a sleep aid. In U.S. Pat. No. 6,004,259 issued Dec. 21, 1999 to Sedaros, a device is shown wherein a mother may record her own heartbeat so that this heartbeat may be played back for an infant as a sleep inducement or sleep relaxation aid.

[0006] In U.S. Pat. No. 5,205,811 issued Apr. 27, 1993 to Fornarelli a baby blanket with a heartbeat simulator of the vibratory type is disclosed. Here, the heartbeat simulator is placed inside of a foam form, and the foam form may be placed inside of a blanket upon which an infant may rest. The heartbeat simulator is pressure activated so that the weight of the infant on the simulator activates the simulator for a selected duration.

[0007] Accordingly, despite the advantages of the preexisting devices, there remains a need for improved heartbeat simulators which can be used in conjunction with infant blankets and various other forms of sleep positioners. There is a need for such a heartbeat simulator that is more convenient to use.

SUMMARY

[0008] Various embodiments are provided for a sleep aid which incorporates a heartbeat simulator for providing a soothing sleeping environment for an infant. The sleep aid, which may be in the form of a sleep positioner or the like, incorporates a cushion of a selected size and configuration to accommodate the infant when placed thereon. In preferred embodiments, the cushion includes a resilient foam padding and an outer casing which substantially surrounds the padding. A heartbeat simulator is at least partially embedded, or otherwise supported by, the positioner's cushion and is operative upon actuation to vibrate in a manner which simulates a mother's heartbeat.

[0009] These and other objects of the present invention will become more readily appreciated and understood from a consideration of the following detailed description of the exemplary embodiments when taken together with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** is a perspective view of a sleep aid incorporating a heartbeat simulator according to a first exemplary embodiment and showing an infant sleeping thereon;

[0011] FIG. **2** is an exploded perspective view illustrating the construction of one of the positioning members for the sleep positioner of FIG. **1**, with its outer casing removed;

[0012] FIG. **3** is a perspective view of the positioning member of FIG. **2** in a fully assembled state;

[0013] FIG. **4** is a perspective view of a second exemplary embodiment of a sleep aid incorporating a heartbeat simulator, and showing an infant steeping thereon;

[0014] FIG. **5** is a perspective view of a third exemplary embodiment of a sleep aid incorporating a heartbeat simulator;

[0015] FIG. **6** is a perspective view of a fourth exemplary embodiment of a sleep aid incorporating a heartbeat simulator, with the sleep aid in the form of a swaddling blanket;

[0016] FIG. **7** is a top perspective view of the heartbeat simulator for use in the various representative sleep aid embodiments;

[0017] FIG. **8** is a schematic circuit diagram for the heartbeat simulator;

[0018] FIG. **9** is a perspective view of the heartbeat simulator's electromagnetic component; and

[0019] FIGS. **10**(*a*)-**10**(*c*) collectively, comprise high level flow diagrams of the various operating modes for the heartbeat simulator which are accomplished by the disclosed circuitry of FIG. **9**.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0020] With initial reference to FIG. **1**, a first exemplary embodiment of a sleep aid **10** is introduced. Sleep aid **10** is substantially in the form of a sleep positioner, such as that described in FIGS. 1-8 of U.S. Pat. No. 6,877,176 B2, issued Apr. 12, 2005 to Houghteling, the disclosure of which is incorporated by reference in its entirety. Accordingly, sleep aid **10** is adapted to be suitably configured to support an infant between first and second positioning members or bumpers **14** and **16**, respectively. These bumpers **14** and **16** are preferably movably and detachably positioned along the lower portion of the pad's top surface to create a suitable width therebetween within which infant **12** is positioned. In this regard, the sleep positioner **10** can be constructed substantially the same as those referred to in the various embodiments disclosed in U.S. Pat. No. 6,877,176 B2.

[0021] However, as may also be seen in FIG. **1**, one of the positioning members, such as first bumper **14**, has a unique construction in that it incorporates a partially embedded heartbeat simulator **20**, as perhaps best illustrated in FIGS. **2** and **3**. Referring to FIG. **2**, bumper **14**, which is a wedge-shaped member having a triangular cross-section, includes a cavity **26** formed in its base which is sized and adapted to accommodate a main body portion **24** of heartbeat simulator **20**. As can be appreciated with reference to FIGS. **2** and **7**, main body portion **24** is generally rectangular in shape and provides a housing to accommodate some of the simulator's circuitry components. To this end, housing **24** has a receptacle portion **28** within which the various components are stored and a coverplate **30** secured thereto via suitable screws, generally **32**, or the like. Protruding from housing **24** so that it is accessible to a caregiver is the actuator portion **22** of the heartbeat simulator **20**. As will be discussed in greater detail below, actuator portion **22** contains first and second actuator buttons **34** and **36**, respectively, as well as indicator lights **37** and **38** and a microphonic element **40**. Actuator **20** is joined in electrical communication to the remaining circuitry components contained within housing **24** via an elongate insulative sleeve **42**, as would be well-known to those skilled in the art.

[0022] With reference, then, to FIG. **3**, it may be seen that once the housing portion of the heartbeat simulator **20** is inserted into the cavity, the casing for first bumper pad **14** may be inserted over the bumper's resilient padding so that the actuator **22** protrudes from the bumper to be accessible by a caregiver. Casing **15** for positioning member **14** is quite similar to that described in U.S. Pat. No. 6,877,176 B2, and it can be appreciated from FIG. **3** that a flap **19** can be included on the casing to releasably engage a band of hook material **17** to encase the stored simulator.

[0023] Before describing the particular construction for the heartbeat simulator itself, reference will now be made to FIGS. **4-6** which illustrate alternative constructions for sleep aids which could incorporate the heartbeat simulator. Thus, with initial reference to FIG. **4**, a sleep aid, again in the form of a sleep positioner, is shown. Sleep aid **50** incorporates a contoured cushion **52** and the heartbeat simulator **20** partially embedded therein. The construction for the contoured cushion **52** is, preferably, similar to that described in U.S. Pat. No. 7,213,281 B2, issued May 8, 2007 to Hahn, the disclosure of which is also incorporated by reference in its entirety. Such a cushion construction can be suitably modified, however, by forming a base cavity or cutout, similar to that described above. The base cavity insertably and removably accommodates the housing portion **24** of heartbeat simulator **20** so that the actuator portion protrudes therefrom to be accessible by a caregiver. The artisan will readily appreciate that a variety of other constructions could be employed to embed or otherwise support the simulator, such as an internal pocket accessible via a slit formed in the encased padding.

[0024] Further, with reference to the embodiment of FIG. **5**, the sleep positioner can assume a configuration substantially like that disclosed in my co-pending patent application Ser. No. 12/013,382, filed Jan. 11, 2008, which is also incorporated by reference in its entirety. In the embodiment of FIG. **5**, however, the sleep positioner **60** has a zipper construction **62** along one of its side margins which can be unzipped to provide access to a slot or cavity within the encased resilient foam padding that is sized and adapted to accommodate the heartbeat simulator's housing portion (not shown). Here again, the actuator **22** protrudes to be accessible.

[0025] Finally, a still further embodiment for a sleep aid is shown in FIG. **6**. Here, sleep aid **70** is in the form of a swaddling blanket **72** for infant **12** wherein the heartbeat simulator is wrapped and placed proximate to the baby's torso.

[0026] Refer now to the remaining figures which describe the operational characteristics of the heartbeat simulator **20** referred to above. When embedded within a sleep aid, upon activation, the heartbeat simulator is operative to simulate the sound and/or feel of a mother's heartbeat. Accordingly, as the above-described embodiments have illustrated, it is preferred to position the heartbeat simulator in an area proximate to the baby's torso region. With reference to FIG. **9**, circuit diagram **100** for the heartbeat simulator would be well understood to those ordinarily skilled in the art of electronics. The values for the various components of the circuitry are tabulated below in Table 1.

TABLE 1

RESISTORS (Ω)	
R1	10R
R2	100K
R3	4R7
R4	100K
R5	100K
R6	4R7
R7	331R
R8	331R
R9	331R
R10	2.2K
R11	360K
R12	10K
R13	5M1
R14	33K
R15	330K
R16	100K
R17	101
R18	2.2K
R*	0
CAPACITORS (μf)	
C1	47/10 V
C2	0.1
C3	100/16 V
C4	—

TABLE 1-continued

C5	104
C6	104
C7	104
C8	0.1
TRANSISTORS	
Q1	S8550
Q2	S8550
Q3	S8550
Q4	C945
Q5	A733
DIODES	
D1	1N4148
LDM	LED
LDS	LED
LOGIC	
U1	AM4ED0097
MISC	
AM	Switch
AS	Switch
POWER	4.5 V
MIC1	~50 dB
J1	Electromagnet

[0027] Some of the principal components for the electronic circuitry **100** are briefly discussed to illustrate how they relate to the construction of the simulator **20** discussed above, for example with reference to FIGS. **2** and **7**. There are two push buttons **34** and **36** which activate the device to place it in one of three modes as will be described below in FIGS. **10**(*a*)-(*c*). Once depressed, these buttons activate LED's. More particularly, when the larger heart-shaped button **38** is depressed, it results in the illumination of LED **38**. Similarly, when the smaller heart-shaped button **36** is depressed, it results in the illumination of LED **37**. Depending on the mode of operation which is selected, as determined by the sequence of buttons pushed, an electromagnet **102** will be activated to pulse at a selected frequency simulating that of a typical heartbeat. The structure of this electromagnet **102** is more particularly shown in FIG. **9** where it may be seen that electromagnet includes a coil **104** and an aluminum yoke **106** having mounting fingers **107**. A steel strike plate **108** is disposed on a lower portion of the yoke and a thin layer of bumper padding (not shown) may be interposed between the strike plate and the coil to muffle noise as coil is energized at a selected pulse rate.

[0028] Referring again to FIG. **9**, if the heartbeat simulator enters into a listening mode, a microphonic device **104**, such as a condenser microphone, is provided to detect any sounds of the baby crying. The microphone's signal is amplified by amplifier sub-circuit **109** which serves to reactivate the pulsating vibration of electromagnet **102**. A programmable integrated circuit chip **103** is powered by a suitable power supply, provided by three 1.5-volt batteries housed within the housing's battery compartment **25** (FIG. **8**). Chip **104** is preferably a programmable microcontroller which provides the logic for the various modes of operation described in FIGS. **10**(*a*)-**10**(*c*). To this end, chip **104** may be part no. AM4ED0097 available from Shenzhen Zesen Science & Technology Co., Ltd. With initial reference to FIG. **10**(*a*), a first mode of operation **110** is described. First mode **110** begins at **112** upon activation of small button **36** which causes the heartbeat simulator to begin beating at **114**. In FIG. **8**, this corresponds to pnp transistor subcircuit **105** driving electromagnet **102**. The device operates at 100% power for ten minutes and then begins to fade until the unit shuts off after twelve minutes. During the tenth minute, the device operates at 75% power, 50% power during the eleventh minute, and then shuts off. Accordingly, it can be appreciated that once the device begins to beat at **114**, a timer is started, and when a determination is made at **116** as to whether the time interval (preferably twelve minutes) has elapsed or the small button is activated again, the device will turn off at **118**.

[0029] In the second mode **120** diagrammed in FIG. **10**(*b*), activation of the large button at **124** causes the device to enter into a listening state **126**. When in the listening state, if the large button is again activated at **128**, the device turns off **130**. Otherwise, the device sits idle to determine at **132** if noise has been detected, namely the baby crying. If a cry is detected, the device then beats at **134** for the selected time interval until that interval has elapsed at **136**. Once the interval has elapsed, the device reenters the listening state **126** and the process is repeated.

[0030] Finally, a third mode of operation is diagrammed in FIG. **10**(*c*). Third mode **140** begins upon activation of the small button at **142** followed by activation of the large button at **144**. Following this button sequence, the device begins to beat at **146** until the internal timer discussed above has elapsed at **148**. At this point, the device enters the listening state **150**. Once in the listening state, if the large button is again activated at **152**, the device is turned off at **154**. Otherwise, the device waits for noise detection at **156**. Once noise is detected, the device again starts to beat at **146**.

[0031] Accordingly, the present invention has been described with some degree of particularity directed to the exemplary embodiments thereof. It should be appreciated, though, that the present invention is defined by the following claims construed in light of the prior art so that modifications or changes may be made to the exemplary embodiments of the present invention without departing from the inventive concepts contained herein.

What is claimed is:

1. A sleep aid, comprising:

a. A sleep positioner having a selected configuration which is sized and adapted to accommodate an infant when placed in a reposed position on a top surface thereof, said positioner including an internal resilient padding and an outer casing substantially enclosing said padding; and

b. A heartbeat simulator at least partially embedded within said sleep positioner, said heartbeat simulator operative upon actuation to vibrate in a manner which simulates a mother's heartbeat.

* * * * *