

# Biomedical Sleep Inducer

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## ABSTRACT

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Sleeping difficulty called insomnia, can involve difficulty in falling asleep one who has first go to bed at night, waking up too early in the morning and waking up often during night. The lack of restful sleep can affect your ability to carry out daily responsibilities. All types of insomnia can lead to day time drowsiness, poor concentration, and the inability to feel refreshed and rested in the morning. Magnetic field associated with the earth is called geo-magnetic fields. It is essentially dipolar on the earth's surface. Many people experience sleeping well in the natural surroundings into a tent or a wooden hut. This fact is due to not only to the healthy atmosphere but also from our unconscious ability to perceive natural earth's magnetic fields. Our paper is about this type of geo-magnetic –fields. This has been designed a circuit, which radiates an electromagnetic field which is low frequency (1.5-5Hz) through a radiator coil and our aim is to perceive them, in this manner our brain is surrounded by an ideal environment for a sound sleep.

Keywords – Sleep inducer, insomnia, geo magnetic field.

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## I. INTRODUCTION

All types of insomnia can lead to daytime drowsiness, poor concentration, and the inability to feel refreshed and rested in the morning. Magnets have been used for centuries to treat a number of physical disorders. We have designed a circuit which creates and radiates an electromagnetic field through a radiator coil and creates an environment helpful for sound sleep. A theory of accelerated transition from wakefulness to sleep is proposed to explain the process of insomnia relief through low-strength static magnetic fields.

Other discovered brainwave entertainment decades ago using binaural beats (sounds) and pulsating light, although it's hard to sleep with these systems due to obvious limitations. Our objective is to design a device which will create the same pattern of wave that creates in brain during sleep. It generates an electromagnetic-field, makes easier to fall asleep, and induces a prolonged and sound sleep without drugs.

### CAUSES OF INSOMNIA

- Life events such as fear, stress, anxiety, emotional or mental tension, work problems, financial stress, birth of a child and bereavement.
- Use of fluoroquinolone antibiotic drugs, associated with more severe and chronic types of insomnia.

- Restless Legs Syndrome, which can cause sleep onset insomnia due to the discomforting sensations felt and the need to move the legs or other body parts to relieve these sensations.
- Disturbances of the circadian rhythm, such as shift work and jet lag, can cause an inability to sleep at some times of the day and excessive sleepiness at other times of the day. Chronic circadian rhythm disorders are characterized by similar symptoms.
- Abuse of over-the counter or prescription sleep aids (sedative or depressant drugs) can produce rebound insomnia.

### SYMPTOMS OF INSOMNIA

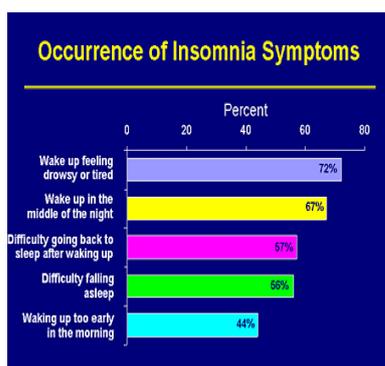
#### Night-time Symptoms:

- Frequent difficulty falling asleep.
- Frequent episodes of waking up accompanied by difficulty in falling back to sleep.
- Waking too early in the morning with inability to fall back to sleep again.
- Non-refreshing night time sleep.

#### Day-time Symptoms:

- Fatigue
- Memory of attention impairment
- Anxiety and irritability
- Depression

➤ Sleepiness



Symptoms of insomnia

Now, a survey is presented in the form of a bar chart fig.1 where it is shown in percentage which indicates patterns of insomnia observed among people. It is clear from the figure that, major portion of these people wake up anytime from sleep and feel drowsy or tired. Among them, 56% people are at terminal stages who are suffering chronic insomnia.

**II. LITERATURE SURVEY**

**INSOMNIA & ITS DIFFERENT STAGES:**

Insomnia or sleeplessness is an individual's reported sleeping difficulties. A definition of insomnia is, Difficulties initiating and maintaining sleep, or non-restorative sleep, associated with impairments of daytime functioning or marked distress for more than 1 month.

Insomnia can occur at any age, but it is particularly common in the elderly. Insomnia can be transient insomnia (lasts for less than a week) or Acute insomnia (means inability to consistently sleep well for a period of less than a month) or chronic insomnia (lasts for longer than a month) which can lead to memory problems, depression, irritability and an increased risk of heart disease and automobile related accidents for math, etc.

**Categories of Brain wave patterns**

- *Beta (14-30Hz)*
  - Concentration, arousal, alertness, cognition
  - Higher levels associated with anxiety, disease, feelings of separation, fight.
- *Alpha(8-13.9Hz)*
  - Relaxation, super learning, relaxed focus, increased serotonin production
- *Theta (4-7.9Hz)*
  - Dreaming sleep (REM sleep)
  - Increased production of catechol amines, increased creativity
- *Delta(1-3.9Hz)*
  - Dreamless sleep

- Human growth hormone released
- Deep, trance-like, non-physical state, loss of body awareness

**Condition of human brain during sleep**

When we close our eyes and relax, the predominant EEG pattern will be a slow oscillation between about 7 and 12 hertz. This waveform is called the alpha rhythm, and is associated with contentment and a decreased level of attention. Opening our eyes and looking around causes the EEG to change to the beta rhythm, occurring between about 17 Hz and 20 Hz. Other frequencies and waveforms are seen in children, different depths of sleep, and various brain disorders such as epilepsy, insomnia etc.

When we first enter sleep, our brain waves decelerate from beta (12 to 18 cycles/second) to alpha (8 to 12 cycles/second) to theta (4 to 8 cycles/second). At this point, stage one begins. The amplitude of sleep waves is lowest during wakefulness (10-30µV) and shows a progressive increase through the various stages of sleep.

**III. METHODOLOGY**

Faradays law of electromagnetic induction is the main principle of this device. Which is a basic law of electromagnetism predicting how a magnetic field will interact with an electric circuit to produce an electromotive force (EMF) a phenomenon called electromagnetic induction.

The brain is always generating a pattern of internal neural frequencies, so called alpha, theta, delta, and beta; names for different ranges of frequencies, plus others, some of which are altered by the patterns of electromagnetism in our environment. Radio waves, cell phone microwaves, TV, and general noise from electric circuits also generate electromagnetic frequencies. The minute electromagnetic patterns of the Earth are also a part of the environment

The world is surrounded by magnetic fields: some generated by the earth's magnetism, others generated by solar storms and changes in weather. Magnetic fields are also created by electrical devices (e.g. motors, televisions, office equipment, computers, microwave ovens, electrical wiring in homes, power lines). Even the human body produces a subtle magnetic fields generated by chemical reaction within cells and ionic currents of the nervous system. An electromagnetic field (EMF) is composed of both an electric and a magnetic field. The electric field is due to the presence of charged particles (such as electrons) and the magnetic field is due to the movement of the charged particles (such as an electron current). Recently, scientists discover that external magnetic fields affect the body's functioning in both different ways

➤ **Procedure**

- Select a timing option by means of the rotary switch SW1.
- Choose 15, 30 or 60 minutes' operation.
- Select "Stop" or "Alternate" mode operation by means of SW2.

- With SW2 closed (Stop mode operation) the electromagnetic radiation stops after the preset time is elapsed.
- With SW2 opened (Alternate mode operation) the device operates for the pre-set time, then pauses for the same amount of time, this cycle repeats indefinitely.

#### IV. CIRCUIT DIAGRAM OF BIOMEDICAL SLEEP INDUCER

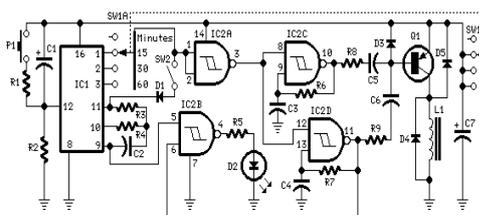


Fig .2 CIRCUIT DIAGRAM

#### ➤ Important points about circuit

- Mean current drawing is about 7mA.
- Battery life can be dramatically increased omitting LED D2 and its associated resistor R5.
- Plastic box can be used to enclose the circuit, metal cases can severely limit electromagnetic radiation.
- To reset a cycle press P1 push button.

#### V. CONSTRUCTION AND WORKING

- IC2C and IC2D generate two square waves at about 1.2 and 5 Hz respectively. These waveforms are converted into 60µS pulses at the same frequencies by means of C5 & C6 and mixed at Q1 Base. This transistor drives the Radiator coil with a scalar series of pulses of 60µS length and 9V amplitude.
- IC1, IC2A & IC2B form the timer section. C1 & R2 provide auto-reset of IC1 at switch-on. The internal oscillator of IC1 drives the 14 stage ripple counter and, after about 15 minutes, output pin 1 goes high. Pin 3 of IC2A goes low and stops IC2C & IC2D oscillation.
- If SW2 is left open (Alternate mode operation), after 15 minutes' pin 1 of IC1 goes low, pin 3 of IC2A goes high and oscillators are enabled again.
- If SW2 is closed (Stop mode operation), the first time output pin 1 of IC1 goes high, the internal oscillator of the IC is disabled by means of D1. Therefore, the circuit remains off until a reset pulse is applied to pin 12 by

means of P1 or when the whole device is switched-off and then restarted.

#### ➤ Working model

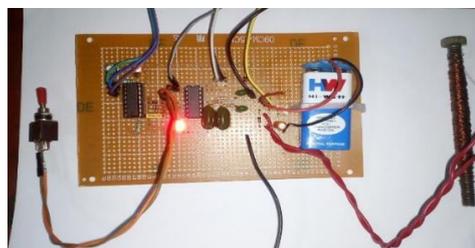


Fig .3 PRACTICAL MODEL

#### ➤ FEATURES OF SLEEP INDUCER:

1. Makes easier to fall asleep.
2. Induces a prolonged and sound sleep without drugs.
3. Generates a natural electromagnetic – field and No side effects.

#### LIMITATIONS

- Radiated power is very small. Because of this, we cannot measure the radiation by using conventional instruments.
- Measuring frequency is difficult in practical case by using oscilloscope.
- Practical value is surprisingly more than theoretical or simulation value.
- Electromagnetic field has been detected through galvanometer deflection but it cannot be measured accurately because lack of flux meter in the lab

Output	Voltage (volts)	Frequency (Hz)
SLEEP INDUCED SIGNAL (TO THE BASE OF THE TRANSISTOR)	6.20	3
RF COIL EXCITATION	8.45	2.5

#### VI. RESULTS

TABLE I. SLEEP INDUCED SIGNAL PARAMETERS



Fig.4 Pulse waveform of 2.5Hz at base terminal (IC4093)

The test circuit is successful in generating the desired signal as per the standard specification. The voltage and the frequency parameters of the generated sleep inducing wave is shown in the Table I. It can be easily seen that the induced waveform falls in the low frequency band of EEG signals. This project helps in fighting insomnia. apart from this it also supports relaxation, stress management and induces sleep easily. This project generates type of geo-magnetic fields and it helps the brain surrounded by an ideal environment for a sound sleep.

➤ **ADVANTAGES:**

- This project helps in fighting insomnia. apart from this it also supports relaxation, stress management and induces sleep easily.
- This project generates type of geo-magnetic fields and it helps the brain surrounded by an ideal environment for a sound sleep.

➤ **DISADVANTAGES:**

- Radiated power is very small. Because of this, we cannot measure the radiation by using conventional instruments.
- Measuring frequency is difficult in practical case by using oscilloscope

**VII. CONCLUSION AND FUTUREWORK**

- This project helps in fighting insomnia. Apart from this it also supports relaxation, stress management and induces sleep easily without



medication.

- This project generates type of geo-magnetic fields and it helps the brain surrounded by an ideal environment for a sound sleep. This project can be improved more.
- The result is not so satisfactory and the research on this respect is yet to develop further more. Now we should try to get more efficiency and also avoid any kind of adverse effects

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