

## Sleep Inducer

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**Abstract** - In today's competitive world mental stress is acute problem. The lack of sleep can often lead to a lot of diseases such as insomnia, memory problems, depression, frustration, irritability, an increased risk of heart disease, anxiety, poor concentration and automobile related accidents etc. Most people just sleep for 3-4 hours a day which is not enough. In reality, people should sleep about 6-7 hours a day. In many cases people use heavy dose of drug to solve this problem which is very harmful for human body. Here are many methods for treatment of insomnia. So, this is a circuit which creates and radiates an electromagnetic field through a radiator coil which is low-cost and user-friendly that helps to fight against insomnia by creating an electromagnetic field. It creates an environment which is helpful to fall first stage of sleep.

**Key Words:** Insomnia, Sleep Inducer, Earth Magnetic Field.

### 1. INTRODUCTION

Sleeplessness or insomnia is difficulties in initiating and maintaining sleep. It is also known as non-restorative sleep, associated with irregularity in daytime functioning. Insomnia can occur at any age, but it is mostly occurred in the elders because of workload, "[2]". In present time, life is very difficult with many worries and busy schedule. So, it is also one of the causes of number of diseases that appear more dangerous because they can cause loss of focus at work and even cause to death. The diseases frequently present in those who work very hard or with high intensity, these diseases are known as sleep disorders. There are many types of sleep disorders: Sleep apnea, sleepwalking, night terrors, sleep eating, restless leg syndrome, jet lag, insomnia, rapid eye movement and muscle paralysis. The over use of drugs to help patients sleep but causes serious problems to the patient's body. The use of drugs to treat insomnia will only have a temporary effect, they are not a permanent treatment, "[1]". So, design a sleeping aid which does not affect patient's body and health, and does not cause side effects such as drug use. This is safe for the user and making the patient very comfortable.

### 1.1 Types of Insomnia

#### 1. Transient insomnia:-

In this, patient can't sleep lasts for less than a week. It is also known as short term insomnia.

#### 2. Acute insomnia:-

It means inability to sleep well for a period of less than a month. It is also known as chronic or long term insomnia which is lasts for longer than a month. Both types of insomnia can lead to daytime drowsiness, poor concentration, and the inability to feel refreshed and rested in the morning.

### 1.2 Symptoms of insomnia

#### Night-time Symptoms:

1. Difficulty falling asleep.
2. Waking up in midnight and having trouble going back to sleep.
3. Feeling tired in morning.
4. Waking too early in the morning with tiredness.
5. Non-refreshing night time sleep.

#### Day-time Symptoms:

1. Fatigue.
2. Difficulty in paying attention.
3. Tiredness and irritability.
4. Depression.
5. Difficulty in focusing on task.
6. Increase number of accidents and errors.

#### Causes of insomnia:

1. Due to fear, stress, emotional or mental tension, workload, financial stress.
2. Restless Legs Syndrome, which can cause the beginning of insomnia due to the discomforting sensations felt and the need to move the legs or other body parts to relieve these sensations.
3. Due to shift work and jet lag, which can cause an inability to sleep at some times of the day and excessive sleepiness at other times of the day, "[2]".

## 2. METHODOLOGY

Magnetic field associated with the earth is called geomagnetic fields. It is basically dipolar (i.e., it has two poles, north pole and south pole) on the surface of earth. Near the earth surface magnetic field becomes stronger and away from the surface, the field becomes distorted. The Earth as well as human brain has its own natural frequencies for electromagnetic radiation,"[1]". The natural frequencies of the human brain are:

1. Beta waves (14 to 30 Hz)
2. Alpha waves (8 to 13 Hz)
3. Theta waves (4 to 7 Hz)
4. Delta waves (1 to 3 Hz)

At Alpha frequencies human brain is in the relaxed condition. At Theta frequencies brain becomes dreamy and creative. At delta frequency brain is in the first stage of sleep.

### Block Diagram

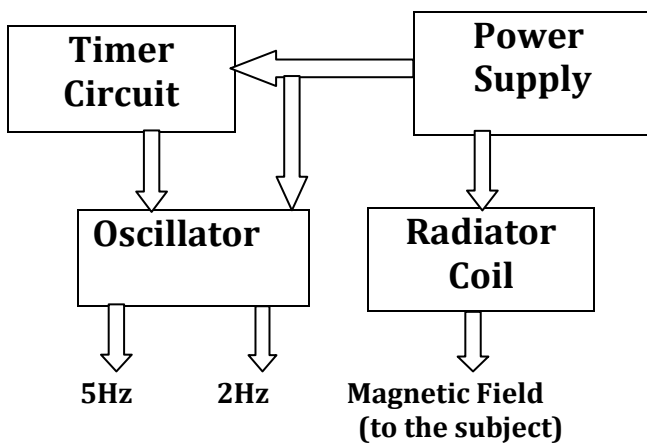
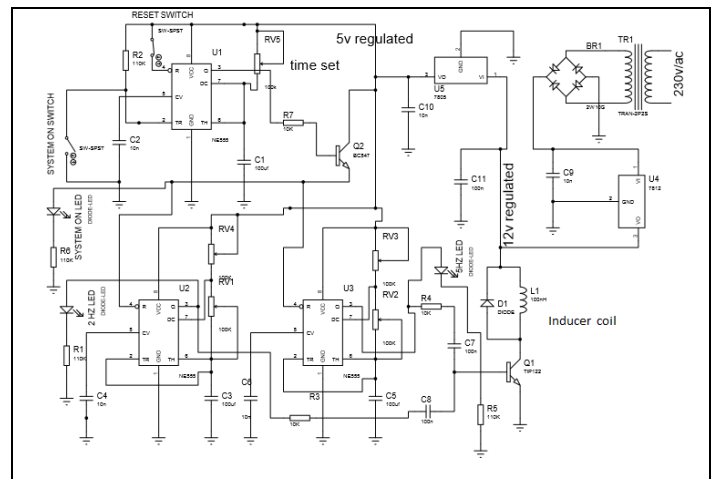


Fig. Block Diagram of Sleep Inducer

Timer circuit and oscillator require 5v dc and radiator coil drives on 12v dc. For all the purpose only one supply is given. By using timer circuit, set the time within an hour of generation of the magnetic field. Oscillator generates the two frequencies such as 2Hz and 5Hz which is given to radiator coil. Radiator coil generates the magnetic field of 2Hz and 5Hz.

### Circuit Diagram

Radiator coil is constructed by winding randomly 620 turns of 0.2 mm.-enameled wire on a 6mm diameter, 40 mm. long,



steel bolts secure the winding with insulating tape. IC555 is used as timer as well as oscillator. RV5 (potentiometer) is used to set the time duration of magnetic field generation. The time duration can be set from 1 minute to 1 hour. Here a SPST switch is used to turn on/off the device and another SPST switch is used at pin 4 to reset the device.

Output of timer is given to the transistor (Q2) BC547. Q2 provides the voltage to the two astable multivibrator with sufficient current. Emitter voltage of BC547 is given to reset pin of two IC's which are acting as astable multivibrator. Two LEDs are glowing for frequency 2Hz and 5Hz. For 2Hz, Pin2 and pin6 of IC555 are combined and grounded through a capacitor C3. In between pin6 and pin7 we are using a variable resistor RV1 and a potentiometer RV4 in between pin7 and pin8 through which capacitor (C3) will charge and discharge.

Charging time for 2Hz:

$$T1 = 0.693(RV4 + RV1)C3$$

$$T1 = 0.693(100k + 100k)2.2\mu f$$

$$T1 = 0.304sec$$

Discharging time for 2Hz:

$$T2 = 0.693(RV4)C3$$

$$T2 = 0.693(100k)2.2\mu f$$

$$T2 = 0.152sec$$

Frequency of oscillation for 2Hz:

$$T = T1 + T2$$

$$T = 0.693(RV4 + 2RV1)C3$$

$$T = 0.693(100k + 2 \times 100k)2.2\mu f$$

$$T = 0.456sec$$

$$F = 1/T$$

$$F = 2.18$$

Charging time For 5Hz :

$$T1 = 0.693(RV3 + RV2)C5$$

$$T1=0.693(100k+100k)1\mu f$$

$$T1=0.136sec$$

Discharging time:

$$T2=0.693(RV4)C5$$

$$T2=0.693(100k)1\mu f$$

$$T2=0.069sec$$

Frequency of oscillation:

$$T=T1+T2$$

$$T=.693(RV4+2RV1)C5$$

$$T=0.693(100k+2\times 100k)1\mu f$$

$$T=0.207sec$$

$$F=1/T$$

$$F=4.83Hz$$

The frequencies from both astable multivibrators are given to transistor Q1(TIP122) which drives the radiator coil and this coil generates the magnetic field.

### Sleep Theory

Sleep occurs in repeating periods. Sleep is divided into two parts in which the body alternates. Sleep occurs in periods of approximately 90 minutes. Sleep proceeds in cycles of NREM and REM. As humans fall asleep, body activity slows down like body temperature, heart rate, breathing rate, and energy all decrease, brain waves get slower and bigger. Sleep affects other brain-body functions, including virtual paralysis of the body. Humans may suffer from various sleep disorders, Insomnia, hypersomnia, sleep apnea and sleep walking etc.

Sleep modes are known as non-REM and REM sleep. Both types are associated with a distinct set of physiological and neurological features.

1. REM stands for "rapid eye movement". REM sleep is consist of more dreaming, faster brain waves, low muscle tone throughout the body, muscle paralysis abnormal behavior during sleep phase, fast pulse and breathing.
2. Non-REM sleep stands for "non-rapid eye movement". and in this dreaming are rare, muscles are not paralyzed and sleep walk problem occurred. The brain uses less energy during sleep than it does in waking. In quiet waking the brain uses 20% of the body's energy.

NREM is divided into three stages: N1, N2, and N3. The whole period proceeds in the order from N1 to N2 to N3 to N2 to REM.

#### Stage 1 (N1):

It is the stage between wakefulness and sleep, in which the muscles are quite active and the eyes rolls slowly and dreaming is rare. Random beta (12-30 Hz) and gamma (25-100 Hz) brain waves are appear, which is the normal range for the awake state. Breathing gradually becomes more regular and the heart rate begins to slow. The person may be aware of sounds and conversations but does not respond to them. This stage represents 5% of the total sleep time.

#### Stage 2 (N2):

Theta waves are appears only. Muscle activity decreases, awareness of the outside world begin to fade fully. If any sounds are heard, the sleeper is not able to understand. It covers 45%-50% of total sleep time for adults.

#### Stage 3 (N3):

It is known as deep or delta (0.5 to 4Hz) or slow-wave sleep (SWS). Greater amount of deep sleep occurred earlier in the night. So, the sleeper response to the outer world is very less and unaware of any sound. Sleep-walking, sleep-talking and bedwetting occur. It covers 15%-20% of total adult sleep time. Brain temperature, breathing rate, heart rate and blood pressure all are decreases. Dreaming is more common. It is difficult to wake a person during this stage. Stage 3 was divided into two stages, stage 3 and stage 4 and it is depending on the frequency of delta waves,"[3]".

### 3. CONCLUSIONS

This device is calculated and adjusted to fit the patient. Patients can carry anywhere because of its compact design. It is easy to use, user-friendly interface and convenient. Sleep inducer device have solved a various types of problems for the elder patients. We calculate the small frequencies device can used by the patient in bed (below the pillow) or on a shelf near which interact to the brain and help the brain respond to the initial state of sleep. This the bed. This project can be improved more. Now we should try to get more efficiency and also avoid any kind of adverse effects

**Result Table**

**BIOGRAPHIES**

Sr. no	Name	Age	Gender	Sleep Disorder	Evaluation
1.	Parveen Walikar	37	Female	Insomnia, Sleep apnea	Fall asleep time is 30min.
2.	Soman	55	Male	Insomnia	Fall asleep time is 30-40min.
3.	Bashir Shaikh	43	Male	Insomnia, Leg syndrome	Fall asleep time is 40-45min. Device should be more compact.
4.	Gopal Chandra	35	Male	Insomnia, Trouble Sleeping	Fall asleep time is 25-30
5.	Minhajoddi n	45	Male	Leg Syndrome, Insomnia	Fall asleep time is 35-40min.



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