IR Light Muscle and Nerve Pain Reliever with Stimulator

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Abstract

The Biomedical devices are played an important in the field medical diagnosing to find the diseases sensitivity in order to giving appropriate treatment to the patients by the Medical Professionals. Nowadays more than thousands of medical devices are available for diagnostics and treatment. The selections of suitable medical devices constantly depend on location (national or regional necessity). The aim of this work is to design IR muscle and nerve pain reliever with aid of stimulator. The advancement in medical field is continuous process at the same time it is necessity to make the improvement in the medical devices also. In that accept we are introduce this device. In this device IR light source is key element. This device reduces and cures the muscle and nerve pain of human body. Presently for pain reliving, using the stimulator and IR lights separately in medical application. In this work we combine the stimulator and IR light source with remote control which is effectively used to reduce the pain. In this device we can also measure the current to passing through the body and the voltage applied to IR light. Study has proven that Infrared light brings wound healing and stimulation of muscle, nerve to reduce the pain on most of the parts of human body. From this study low-cost portable and high performance device can be designed and implemented. The performance test of the system has shown that the results are reliable. The overall system can be used IR light source and muscle, nerve stimulator under safe conditions.
Keywords: IR Nerve Stimulator, Muscle Stimulation, Pain Reliver, Remote Control

I. INTRODUCTION

A. Human Muscles System

This is the muscular system. There are three main types of muscles in the human body: skeletal muscle, smooth muscle, and cardiac muscle. Skeletal muscles are attached to bones and allow us to move our bones and joints. They control the movements we make, from writing with a pencil and snapping our fingers to running and swimming. Smooth muscles are what our organs and internal parts use to move. They control our digestive, circulatory, excretory, and reproductive systems. The cardiac muscle is found only in the heart and it is what pumps blood throughout our body every minute of every day of our life.

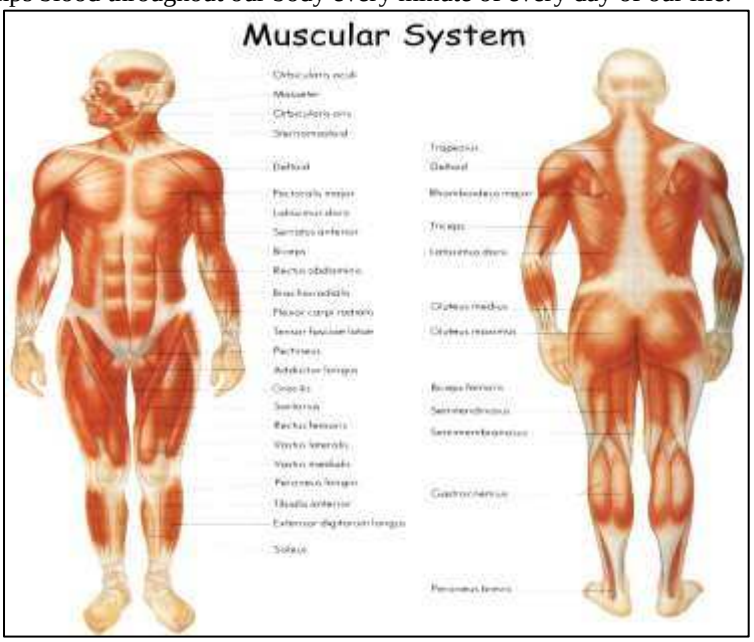


Fig. 1: Human Muscular Systems

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B. Human Nerve System

This is the nervous system. It controls all of our body's actions and senses as well as feelings, emotions, and memories. The nervous system includes our brain, spinal cord, and nerves. The brain works with a network of nerves throughout our body. Our brain sends signals to our body parts telling them what to do. Likewise, our body parts send signals to the brain. Our spinal cord transmits signals and is also our reflex center. The nervous system tells our respiratory system to breathe, our digestive system to grind up food, and our heart how fast to heart among many other things. Every single thing our body does (and feels) relates to our nervous system.

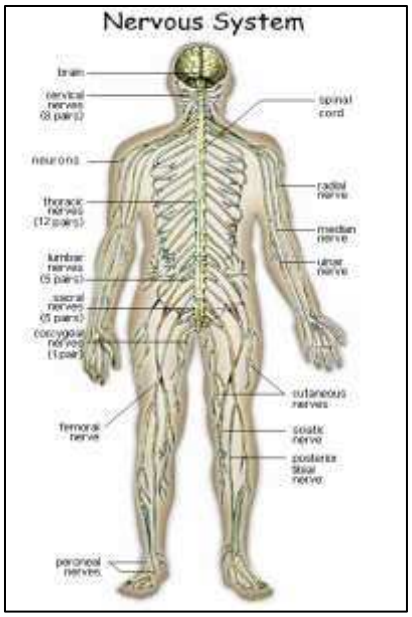


Fig. 2: Human Nerve Systems

C. IR Light Source

Infrared (IR) is imperceptible brilliant vitality, electromagnetic radiation with longer wavelengths than those of noticeable light, stretching out from the ostensible red edge of the obvious range at 700 nanometers (recurrence 430 THz) to 1 mm (300 GHz)(although individuals can see infrared up to no less than 1050 nm in investigations. A large portion of the warm radiation discharged by items close room temperature is infrared. Keeping in mind the end goal to comprehend night vision, it is imperative to comprehend something about light. The measure of vitality in a light wave is identified with its wavelength: Shorter wavelengths have higher vitality. Of noticeable light, violet has the most vitality, and red has the minimum. Only alongside the obvious light range is the infrared range.

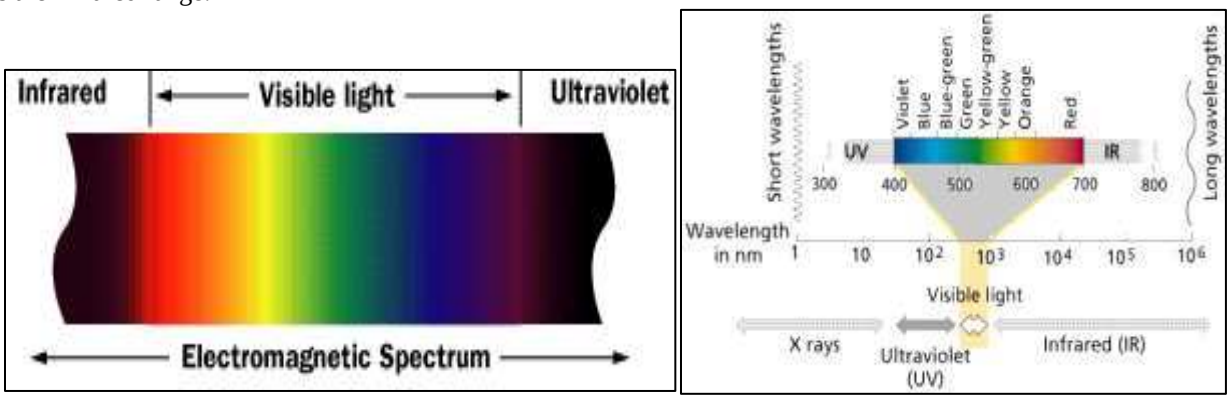


Fig. 3: IR Light Sources

Infrared radiation was found in 1800 by cosmologist Sir William Herschel, who found a kind of undetectable radiation in the range bring down in vitality than red light, by methods for its impact upon a thermometer.[6] Slightly the greater part of the aggregate vitality from the Sun was in the long run found to touch base on Earth as infrared. The harmony amongst consumed and discharged infrared radiation critically affects Earth's atmosphere.

Infrared light can be part into three classes:

– Near infrared (Near IR) - Closest to obvious light, close IR has wavelengths that range from 0.7 to 1.3 microns, or 700 billionths to 1,300 billionths of a meter.

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- Mid-infrared (mid-IR) - Mid-IR has wavelengths going from 1.3 to 3 microns. Both close IR and mid-IR are utilized by an assortment of electronic gadgets, including remote controls.
- Warm infrared (warm IR) - Occupying the biggest piece of the infrared range, warm IR has wavelengths going from 3 microns to more than 30 microns.

The key distinction between warm IR and the other two is that warm IR is transmitted by a question rather than reflected off it. Infrared light is discharged by a question in light of what is going on at the nuclear level.

II. MUSCLE STIMULATOR

The muscle systems of humans are complex electrochemical machines. The electrophysiological study of a muscle system treats the system as an electrical device built of very complex, non-linear elements called fibers. To understand the function of a muscles, or network of muscles, one must probe the system with pulses and record what happens. For instance, a researcher might apply pulses to a muscle and measure muscle sensitivity. The device to be described here allows a researcher to inject electrical pulses into muscle tissue.

III. NERVE STIMULATOR

Electrical nerve stimulation (ENS) is a methodology of pain relief that can facilitate some individuals with long painful conditions. Associate ENS machine is a tiny, battery-operated device that has leads connected to electrodes. We attach the electrodes to our skin exploitation self-adhesive pads. Once the machine is switched on, little electrical impulses square measure delivered to the affected space of our body that we feel as a tingling sensation. The electrical impulses will block or cut back the pain signals reaching to the medulla spinals and brain, which may help cut back or relieve pain.

IV. INFRARED LIGHT IN MEDICAL

Infrared light treatment is a restorative system that utilizations light to mend focused on cells in the body. A particular preferred standpoint that this kind of treatment has over different procedures is that it is totally noninvasive and moderately easy. The mending impacts of infrared light keep going for a few hours after treatment, making it a favored system for some patients.

The procedure takes a shot at the standards behind photograph incitement. The thought is that cells in the human body respond normally to daylight. The warmth from light can empower the arrival of nitric oxide, which supports blood dissemination to the influenced range. Thus, the region being treated with phototherapy gets the oxygen and supplements it needs to recuperate with expanded proficiency.

Lamentably, drawn out presentation to daylight additionally can demonstrate risky. The skin may consume, and the likelihood of creating skin growth increments. Infrared light treatment dispenses with these dangers totally, particularly due to the utilization of infrared light. Infrared light contains the vast majority of the warmth required for photograph incitement and has a wavelength longer than obvious light. By separating infrared light, advisors can exploit its mending properties without presenting their patients to other hurtful wavelengths.

Light treatment utilizing infrared wavelengths is regularly done by wrapping issue regions in uncommon cushions and presenting them to infrared light. The light frequently originates from specific light emanating diodes (LED's), driving a few facilities to allude to infrared light treatment as LED treatment. The light then enters the skin for up to around 1.2 inches (3 cm), following up on cells en route.

After the cells are enacted by the infrared light, the body's normal mending procedure is fortified and in this manner accelerated. The body encounters an expanded creation of collagen and adenosine triphosphate (ATP), and additionally helped deoxyribonucleic corrosive (DNA) and ribonucleic corrosive (RNA) union. This achieves a few advantages, including torment help and tissue repair. This turns out to be particularly helpful for diabetics, who may require light treatment for wounds as a result of debilitated recuperating.

Infrared light treatment likewise is utilized to treat skin break out. The expanded generation of ATP wipes out any microbes in the pores. This incorporates the microbes that cause pimples. Enhanced collagen generation likewise recuperates any scars that may have framed.

V. WORKING PRINCIPLE OF STIMULATOR

The device has been conceived to deliver constant current stimulation impulses. It allows also acquiring Electrical signal with the difference between two nerve electrodes and a reference erasing with one electrode laid on a bony point. In muscle stimulator frequency range is 3Hz standard and amplitude is 0-100 mA variables. In nerve stimulator frequency range is 0- 50 Hz, pulse with 1-250u.sec and amplitude 0-100 mA variables. When changing the switch, we switch over one program to another.

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VI. DESIGN METHODOLOGY

Using 8051 Microcontroller we tend to style the circuit. The capability supply is in battery or device vary of 9V/150m.Ah. The frequency range is 0-150 Hz and amplitude is 0-100mA.The frequency and amplitude each are manually controlled by the separate potentiometer. The output is connected with silicon pads (Electrodes). The liquid crystal display is indicating the present range that is increasing through pot. The passing current between two electrodes may be noticed in LCD. The microcontroller chosen for our transportable stimulator could be a 150 rates, low-power, 8-bit RISC chips with 128 KB of programmable flash and 4 KB of EEPROM. This microcontroller additionally includes associate degree on-board, 8-channel, 10-bit, digitizer (ADC); 32 programmable I/O lines; master/slave SPI; and two 8-bit and one 16-bit counter. Signals from this management module, HV power offer module, and batteries area unit unceasingly sampled by the ADC and monitored for errors to make sure that the stimulator is safely operative at intervals predefined parameters. Eight I/O lines to the digital-analog converter (DAC) give the analog signals that set the stimulation current and therefore the HV threshold, and an extra nine lines area unit accustomed management the stimulation pulse breadth and frequency generator. The communications module at intervals is optically isolated from the controller to defend the user from potential grounding issues that would occur by touching the outside casing of the controller whereas stimulating.

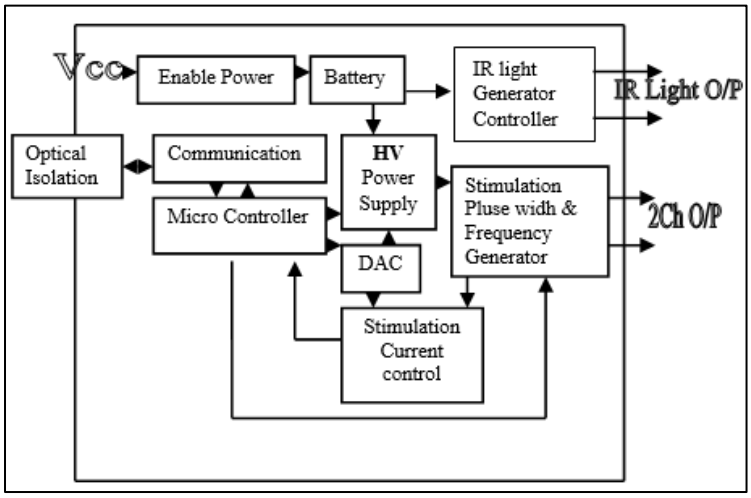


Fig. 4: Block Diagram of IR Muscle and Nerve Pain Reliever with Stimulator

VII. WORKING PRINCIPLE OF IR LIGHT

Infrared light treatment is a type of phototherapy where it is specifically connected to your body to cure ailment. No prescriptions are included in this treatment. The harmed or agonizing some portion of the body is initially wrapped up with a few cushions that contain little LED's that emanate infrared beams. At the point when infrared light enters the skin surface, it encourages arrival of nitric oxide. This specific part unwinds the veins and avoids development of blood clumps. Therefore it enhances blood dissemination to the influenced territory. As more blood achieve the harmed tissue, the supply of oxygen and profitable supplements to it likewise increments. Along these lines, it guarantees speedier recuperating of harmed tissues.

VIII. PATIENT DATA OBTAINED WITH MUSCLE STIMULATOR

When we give the treatment for muscles with using electrical muscle stimulation we are not able to find the improvements in muscle sensitivity immediately. Using our system we are able to find the muscle sensitivity accurately. When we give the electrical stimulation using our system, the electrode is converted electrical signal in to current. In that when we feel the instill stage of current in our muscle is noted, after that we applying the electrical signal (Increases the amplitude) continuously the maximum withstanding current is noted which is shown in LCD display.

The DATA sheet is shown the First patient condition (Muscle Sensitivity)

Patient Name: Xxx, Age: 38, Wight: 62, Gender: F,

BP: 120/80. Days – 5, Part: Right arm

Table - 1
Electrodes Connected for First Patient

No. of Day	*Insel sens (mA)*	*With stand Sens(mA)*	*Frequency (KHz)*	*Time (min)*
1	*08*	*18*	*2*	*15*
2	*09*	*19*	*2*	*15*
3	*09*	*19*	*2*	*15*
4	*10*	*21*	*2*	*15*
5	*09*	*20*	*2*	*15*

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The DATA sheet is shown the Second patient condition (Muscle Sensitivity)
Patient Name: Yyy, Age: 28, Wight: 45, Gender: F,
BP: 130/90. Days – 5, Part: Right arm

Table - 2
Electrodes Connected For Second Patient

No. of Day	*Insel sens (mA)*	*With stand Sens(mA)*	*Frequency (KHz)*	*Time (min)*
1	*13*	*24*	*2*	*15*
2	*14*	*25*	*2*	*15*
3	*15*	*26*	*2*	*15*
4	*15*	*27*	*2*	*15*
5	*16*	*26*	*2*	*15*

IX. APPLICATION OF THE INFRA-RED LIGHT STIMULATOR

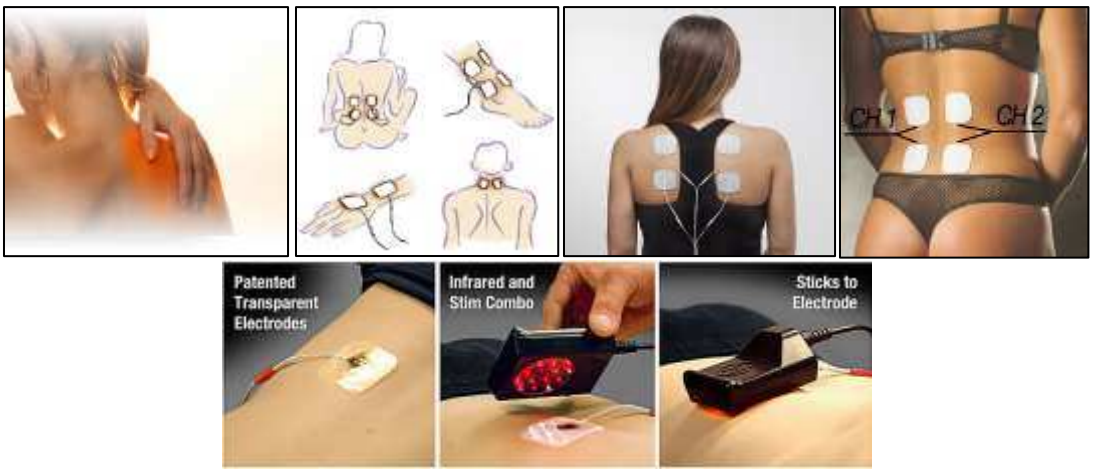


Fig. 5: Placements of Electrodes for patient

Rehabilitation purposes, Physiotherapy, Beauty Industry (cleansing / nourishing the skin), Brain Stimulation Therapies, Improves the function of the cellular membrane, Acupuncture, Pregnancy-Stop the Pain and Suffering, Improvement in the Vascular and Lymphatic, Fat to be dispersed & eliminated, Cure for muscle spasms.

A. Medical Applications

Infrared light can be used for the treatment of minor problems like acne to more serious ailments like chronic arthritic pain or high blood pressure.

- Cure for Acne - At the point when infrared light is utilized to treat skin inflammation, ATP (Adenosine triphosphate, a particle that exchanges compound vitality inside cells for metabolic procedures) in the skin cells gets actuated and slaughters the microscopic organisms show in the skin pores. At the point when there is no microbes, the skin aggravation goes down and skin inflammation is cured.
- Unending Pain Relief - Chronic torment coming about because of joint inflammation, neck agony or hardened muscles can be treated with the assistance of this treatment. When it is regulated on a weakness, the rigid muscles relax up and the going with torment is mitigated.
- Treating Sports Injury - Most of the hurts, soreness and swellings that competitors experience the ill effects of are either because of sprains or because of nerve cell harm. These beams alleviate the nerve tract and empower the pituitary organ which discharges endorphins in the body. Endorphins are generally alluded to as 'normal torment relievers'. With the arrival of endorphins, torment is reduced actually.
- Mending Diabetic Wounds - Diabetic patients have low levels of nitric oxide in blood on the grounds that their insulin-subordinate veins turn out to be less receptive to nitric oxide. Subsequently, if there should arise an occurrence of an outside harm, their injury sets aside longer opportunity to mend up. Infrared light encourages the arrival of nitric oxide, which thus, enhances blood stream. Because of increment in blood flow, wounds mend up rapidly.
- Bringing down High Blood Pressure - High pulse can prompt different life-debilitating maladies like heart assault and stroke. At the point when a man is experiencing hypertension, it implies that the heart needs to strive to keep up legitimate supply of blood all through the body. Utilization of infrared beams expands the blood course in the body. In this way, the heart does not need to strain itself to pump out the blood. This lessens pulse.

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B. Symptoms

This treatment is considered as one of the most secure types of treatment gave it is done under the supervision of an accomplished specialist. Scientists, up until this point, have not found any real symptoms of this treatment. Some minor reactions like nervousness, dejection and craziness can be seen in a few patients experiencing the treatment. These sorts of inclination changes are effectively controllable.

C. Safeguards

As we definitely know, that there are no real symptoms. Be that as it may, before managing infrared light, the physical state of the patient ought to be tried. There are sure physical conditions in which this treatment ought to be entirely maintained a strategic distance from. They are:

- If the patient's eyes are delicate towards photograph danger.
- If a patient has a past therapeutic history of state of mind issue like lunacy.
- If the patient has photograph delicate skin.
- If the patient is taking any sort of photosensitizing pharmaceutical.
- If the patient has acquired or gained any confusion like porphyria (an uncommon catalyst issue that influences the skin and sensory system)

As of late, therapeutic analysts have discovered preparatory proof that this treatment can be utilized on patients experiencing loss of vision due to over-introduction to light. Heaps of research is going ahead to see if maladies like growth or tumor can be determined to have the assistance of this treatment. Numerous specialists trust that it can possibly upset the universe of solution in future.

X. SAFETY OF THE INSTRUMENT

When the stimulator is connected to the patient at the time the remote is given to the patient. When the patient feels uncomfortable they press the special key to switch off the function of the instrument.

XI. CONCLUSION

A microcontroller based and IR light attached electrical muscle and nervous stimulation make the operation easy, System cost reduced, Output results become accurate, it make the system user friendly one.

XII. FUTURE DEVELOPMENT

Multiple waveforms can be analyzed, Multiple Channels (More than two) can utilized, Connectivity with PC, Automatic stimulation (Using Remote).

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